UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

CHAIRMAN

August 11, 2010

The President
The White House
Washington, D.C. 20500

Dear Mr. President:

In accordance with Section 651(d) of the Energy Policy Act of 2005 (Public Law 109-58), I am providing the enclosed report documenting the efforts of the Radiation Source Protection and Security Task Force (Task Force).

The Energy Policy Act charged the Task Force with 1) evaluating and providing recommendations relating to the security of radiation sources in the United States from potential terrorist threats, including acts of sabotage, theft, or use of a radiological source in a radiological dispersal device; and 2) providing, within 1 year of enactment, and not less than every 4 years thereafter, reports containing its recommendations, including recommendations for appropriate regulatory and legislative changes, to the Congress and the President.

On August 15, 2006, the Task Force submitted the first report. At that time, the Task Force found no significant gaps that were not already being addressed, nor made any recommendations for legislative changes. The Task Force identified a number of near-term actions planned or underway to further strengthen regulatory controls and made several recommendations to enhance the overall security of risk-significant radioactive sources.

Over the last 4 years, the Task Force, which includes membership from 14 Federal agencies and 2 State organizations, has made significant progress in ensuring that the United States continues to be a world leader in applying the International Atomic Energy Agency's "Code of Conduct on the Safety and Security of Radioactive Sources (Code of Conduct)," published in 2003, through strengthening the system of regulatory controls. The United States is committed to the Code of Conduct through the development, harmonization and implementation of national policies, laws and regulations, and through the fostering of international co-operation. Domestically, we maintain a high level of safety and security of risk-significant radioactive sources, as discussed in the 2006 Task Force report, as well as addressed in the enclosed quadrennial Task Force report, and we will continue to set the example to other nations for the security of these sources.

If you have any questions, please feel free to contact me. I may be reached by phone at (301) 415-1750.

Respectfully,

Gregory B. Jaczko

Enclosure:
Radiation Source Protection and
Security Task Force Report

Identical letters sent to:

The President
The White House
Washington, D.C. 20500

The Honorable Joseph R. Biden, Jr.
President of the United States Senate
Washington, D.C. 20510

The Honorable Nancy Pelosi
Speaker of the House of Representatives
Washington, D.C. 20515

The Honorable Jeff Bingaman
Chairman, Committee on Energy
and Natural Resources
United States Senate
Washington, D.C. 20510
cc: Senator Lisa Murkowski

The Honorable Barbara Boxer
Chairman, Committee on Environment
and Public Works
United States Senate
Washington, D.C. 20510
cc: Senator James M. Inhofe

The Honorable Henry A. Waxman
Chairman, Committee on Energy
and Commerce
United States House of Representatives
Washington, D.C. 20515
cc: Representative Joe Barton

The Honorable Edward J. Markey
Chairman, Subcommittee on Energy
and Environment
Committee on Energy and Commerce
United States House of Representatives
Washington, D.C. 20515
cc: Representative Fred Upton

The Honorable Thomas R. Carper
Chairman, Subcommittee on Clean Air
and Nuclear Safety
Committee on Environment and Public Works
United States Senate
Washington, D.C. 20510
cc: Senator David Vitter

The Honorable Joseph I. Lieberman
Chairman, Committee on Homeland Security
and Governmental Affairs
United States Senate
Washington, D.C. 20510
cc: Senator Susan Collins

The Honorable Bennie G. Thompson
Chairman, Committee on Homeland Security
United States House of Representatives
Washington, D.C. 20515
cc: Representative Peter T. King

Report to the President and
the U.S. Congress
Under Public Law 109-58,
The Energy Policy Act of 2005

The 2010 Radiation Source Protection and Security Task Force Report

Submitted by:
The Chairman of the U.S. Nuclear Regulatory Commission

On Behalf of:
Radiation Source Protection
and Security Task Force

Key Accomplishments, Challenges, and Recommendations

Established by the Energy Policy Act of 2005 (EPAct), the Interagency Task Force on Radiation Source Protection and Security (Task Force) has made important progress since its 2006 report to the President and Congress to improve the security of domestic radioactive sources given the enduring threat of terrorists seeking radioactive materials to attack the United States. The Task Force is pleased to note in this 2010 report the many accomplishments achieved over the past 4 years, including the closeout of a number of significant recommendations from the 2006 report. As was the case with the 2006 report, this report is limited to issues relating to the security of radiation sources and does not address issues relating to other radioactive material, such as spent nuclear fuel and high-level waste.

Key Accomplishments since 2006

The Task Force and interagency group have accomplished the following key actions:

- √ Since 2006, interagency preparedness has increased. Also, interagency coordination and the interagency group's ability to communicate with the public during an emergency have improved with regard to assessing security programs, making risk-significant radioactive sources more secure, and mitigating consequences—thereby reducing the potential risk of use by terrorists. For example, the Task Force devised a plan of action for a comprehensive public education campaign with the goals of increasing public understanding of radiological threats and reducing fears, thereby diminishing the impact of a radiological attack and improving response and recovery in its aftermath. The plan includes a comprehensive compendium of existing educational resources and material that can be used to facilitate a public education campaign. As an outcome of coordination efforts between the interagency, it was agreed to transfer all of the public education outreach initiatives to the Federal Emergency Management Agency (FEMA), the lead for the U.S. Government in public communication on issues related to radiation and other hazards. However, the Task Force will continue to support FEMA's progress on this campaign and will stay apprised of its developments.

- √ In 2007–2009, the Task Force reevaluated the list of risk-significant radioactive sources and the associated threshold quantities warranting enhanced security and protection to assess their adequacy in light of the evolving threat environment. The analysis was based on considerations such as the economic and social consequences of an attack using a radiological dispersal device. It concluded that no changes should be made to the list of existing 16 radionuclides and associated established threshold quantities, but 7 additional radionuclides may be considered for enhanced control in some limited situations. Also, the Task Force achieved Federal concurrence on the definitions of a significant radiological dispersal device and a significant radiation exposure device. The definitions are intended to provide the foundations for identifying and assessing potential hazards, determining the levels of relative risk that can be adequately managed, and prioritizing and allocating resources to prevent and protect against radiological incidents.

- √ Since 2007, existing security was improved by (1) requiring fingerprinting and Federal Bureau of Investigation criminal history records checks of all individuals with unescorted access to risk-significant quantities of radioactive materials to further improve the tools available to determine trustworthiness and reliability, and (2) providing voluntary security enhancements and specialized training to sites and local law enforcement agencies.

√ In January 2009, the U.S. Nuclear Regulatory Commission (NRC) deployed a major security initiative—the National Source Tracking System. This computer system, mandated in the EPAct [EPAct 2005], tracks the possession and transfers of more than 70,000 risk-significant radioactive sources over the life cycle of those sources. The system improves the ability of regulators to detect and act upon inventory anomalies, respond to emergencies, and verify legitimate import, export, ownership, and use of sources. Similarly, the U.S. Department of Energy (DOE) has successfully initiated the Radiological Source Registry and Tracking System (RSRT) within DOE, and DOE sites are now reporting approximately 2,300 risk-significant radioactive materials to RSRT, a centralized system.

√ In 2007–2009, the Task Force conducted a study to assess the feasibility of phasing out the use of cesium-137 in a highly dispersible form (cesium chloride (CsCl)). Considering the results of the study and other input received, the Task Force concluded that immediate phase-out would not be feasible because the sources are extensively used in a wide range of applications in medicine, industry, and research with significant health benefits to patients. However, a gradual, stepwise phase-out could be feasible as alternatives become technologically and economically viable and if disposal pathways are identified. Also, the security of these sources has substantively improved with the implementation of security requirements, such as the increased controls, and voluntary facility and device hardening measures. The study identified a path forward that involves a comprehensive multipart approach for further improving the security of and reducing the risks associated with these sources. The Task Force deemed that sufficient time is required for the development of replacement technologies for certain applications and for the identification of disposal pathways for disused sources. In the interim, measures such as enhancing the physical security of existing devices provide more effective protection of the CsCl sources currently in use. For example, the NRC is cooperating with the DOE/National Nuclear Security Administration (NNSA) to provide, on a voluntary basis, physical protection upgrades to existing CsCl irradiators to complement the security afforded through regulatory requirements.

√ In 2008–2010, the Task Force evaluated alternative technologies for the seven most common risk-significant radioactive devices. It assessed financial incentives, research needs, and the costs and benefits of potential alternative devices. The analysis found that while alternatives exist for some applications, the viability, relative risk reduction achievable, and stage of development of these alternatives vary greatly. Although alternative forms and radionuclides were assessed, further risk reduction might be achieved through alternative technology research and development that focuses on non-radioactive replacement (e.g., x-ray). X-ray technologies were found to be cost-competitive with radionuclide technologies on an annualized cost basis. However, technological concerns remain with x-ray devices—specifically, product throughput and downtime of the x-ray devices. The study concluded that successful replacement of the radionuclide technologies with alternatives will require different timetables for each application, will need to be incentivized, and will require a coordinated effort among a wide range of stakeholders. As further discussed, the availability of disposal pathways for radioactive sources should be considered before widespread replacement of radioactive sources with alternative technologies occurs.

√ By 2010, 100 countries had made a political commitment to follow the International Atomic Energy Agency Code of Conduct on the Safety and Security of Radioactive Sources (Code of Conduct) [IAEA 2004]. This is a substantial increase from the 86 countries that made the commitment by 2006. Internationally, the United States has a lead role in building global recognition and observance of this non-binding standard for the life-cycle control of radioactive sources and was instrumental in gaining endorsement of the Code of Conduct by leaders at the Group of Eight (G-8), U.S.–European Union, Asia-Pacific Economic Cooperation, and Organization for Security and Co-operation in Europe summits.

Key Challenges and Recommendations

In addition to its many accomplishments, the Task Force identified two major challenges that require attention at higher levels and developed the following recommendations:

(1) Disposal of Disused Radioactive Sources[1]

Challenge: By far the most significant challenge identified is access to disposal for disused radioactive sources. Under the Low-Level Radioactive Waste Policy Amendments Act of 1985 (LLWPAA), States must provide disposal capability for commercial Class A, B, and C low-level radioactive waste [LLRWPAA 1985]. The Act encouraged the States to enter into regional compacts that would allow them to dispose of waste at a regional disposal facility and exclude wastes from States outside that compact. Disposal access, already a challenge before 2006, has diminished substantially since that time and a comprehensive change is needed to overcome current barriers in the disposal framework. In July 2008, the commercial low-level radioactive waste disposal site near Barnwell, SC closed to out-of-compact waste, leaving licensees in the 36 States outside of the Atlantic, Rocky Mountain, and Northwest Compacts without disposal access for Class A, B, and C low-level radioactive waste. In addition, because of its relatively low activity limits, the Barnwell facility does not accept most sealed sources as Class B and C low-level radioactive waste even from Atlantic Compact States. Also, many of the risk-significant sealed sources qualify as greater than Class C (GTCC) low-level radioactive waste, for which there is no current disposal capability. Under current regulations, GTCC waste would be disposed of in a geologic repository unless alternative methods of disposal are proposed to and approved by the NRC. DOE is responsible for developing the capability to dispose of GTCC wastes from NRC and Agreement State licensees in accordance with the LLWPAA.

[1] Every year, thousands of sources become disused and unwanted in the United States. While secure storage is a temporary measure, the longer sources remain disused or unwanted the chances increase that they will become unsecured or abandoned. These sources have been the focus of much interagency attention from a national security standpoint since the publication of the 2006 report. However, in many cases, disposal pathways are not currently available for disused sealed sources (and there are restricted options for storage of no-disposal-pathway waste). Continued coordinated effort is needed to make sure that comprehensive, sustainable disposal pathways for all disused sealed sources are developed in the interest of national security. These concerns are specific to disposal of radiation sources and do not relate to the storage and disposal of other radioactive materials, such as spent nuclear fuel and high-level waste.

As a result, most licensees now have no commercial disposal option and must instead implement on-site long-term storage of their disused or unwanted sealed sources. While current Federal and State regulations and inspection programs provide assurance that these disused sources remain secure while in long-term storage, disposal is considered the most secure management approach.

In response to the challenge of diminishing disposal capacity, some progress has been made in pursuing solutions. However, final implementation of these ongoing efforts may ultimately require the highest levels of government involvement, including congressional action.

- Notably, DOE has initiated the development of an environmental impact statement to evaluate potential disposal options for GTCC waste. DOE is developing a draft environmental impact statement (EIS) and expects to issue the final EIS in 2011. Under EPAct Section 631(b), before DOE can issue a final decision on a disposal alternative, it must first issue a report to Congress describing the disposal alternatives under consideration and await congressional action.

- In addition, DOE determined that some sealed sources recovered by the DOE/NNSA Global Threat Reduction Initiative Offsite Source Recovery Program can be disposed of as DOE waste at existing DOE facilities. This reduced the backlog of recovered sealed sources in storage. However, there are similar sources registered with the program for recovery from U.S. owners that contain foreign-origin radioactive material (e.g., Russian-origin americium-241) which do not currently have a disposal path and recovery is severely constrained until a disposal path is available.

- Finally, in September 2009, the State of Texas licensed the construction of a new facility to provide a disposal capability for certain classes of low-level radioactive waste, including disused sealed sources for licensees in the Texas Compact (Vermont and Texas). This will be the first new facility to serve as a regional compact site since the passage of the LLWPAA. Also in September 2009, the State of Texas licensed the construction of a facility for the disposal of Federal low-level radioactive waste and mixed low-level radioactive waste. It is expected that both facilities will be operational in 2011.

Recommendations: To address these difficulties, the Task Force recommends that (1) DOE continue its ongoing efforts to develop GTCC disposal capability subject to required congressional action, (2) the U.S. Government and States continue to evaluate waste disposal options for disused radioactive sealed sources, and (3) Federal and State governments investigate options such as providing short-term secured storage of sources recovered from U.S. owners that contain foreign-origin americium-241 radioactive material so these sources can be recovered now and increase efforts to investigate options for disposal of these sources.

(2) Alternative Technologies

Challenge: A second major area that the Task Force has devoted considerable effort to is the examination of alternatives to certain risk-significant radioactive sources (americium-241, cesium-137, cobalt-60, and iridium-192 sources). The replacement of these sources with a lower risk alternative would reduce the security concerns associated with these sources. Three types of alternatives could serve as replacements for risk-significant radionuclides: (1) technologies that use the same radionuclide with a different chemical or physical form (e.g., replacing cesium-137 salt with less dispersible cesium-137 ceramic), (2) technologies that use a

different radionuclide (e.g., replacement of cesium-137 salt with cobalt-60 metal), and (3) technologies that do not use a radionuclide (e.g., x-ray technology). Although alternative forms and radionuclides were assessed, further risk reduction might be achieved through alternative technology research and development that focuses on non-radioactive replacement (e.g., x-ray). While alternatives exist for some applications, financial, logistical, functional, relative risk, and disposal issues can impede the deployment of alternatives and their replacement of current operating technology.

Recommendations: To promote the replacement of risk-significant radioactive sources, the Task Force recommends that the U.S. Government should enhance support of short-term and long-term research and development for alternative technologies to replace current technologies that use americium-241, cesium-137, cobalt-60, and iridium-192 in risk-significant quantities. Contingent upon the availability of viable alternative technologies and taking into consideration the availability of disposal pathways for disused sources, the U.S. Government should investigate options such as a voluntary prioritized, Government-incentivized program for the replacement of devices containing risk-significant quantities of radioactive material with effective alternatives. While it is prudent to continue to look for viable alternative technologies and sources, a decision on whether to discontinue NRC and Agreement State licensing or export of CsCl sources containing risk-significant quantities of radioactive material should be contingent on the existence of viable alternative technologies, and take into consideration the availability of disposal capacity and the changes in the threat environment. On June 29, 2010, the NRC published a draft policy statement on the protection of CsCl sources in the *Federal Register* for public comment [NRC 2010c]. The detailed principles of the policy statement are provided in Chapter 4 and are reflected in the direction proposed in the recommendations of this report.

Contents

Appendices

Tables

Figure

Background

Given the enduring threat of terrorists seeking radioactive materials to attack the United States, the U.S. Government continues to participate in efforts to address radioactive source protection and security. The ability of terrorists to carry out such an attack has been of particular concern because of the widespread availability of radioactive materials in the United States and abroad for beneficial use by industry, hospitals, and academic institutions. The loss or theft of such materials could lead to their diversion for malicious use in a radiological dispersal device (RDD) or a radiation exposure device (RED).

The Energy Policy Act of 2005 (Public Law 109-58) [EPAct 2005], hereafter called the EPAct, established an interagency task force on radiation source protection and security under the lead of the U.S. Nuclear Regulatory Commission (NRC) to evaluate and provide recommendations to the President and Congress relating to the security of radiation sources in the United States from potential terrorist threats, including acts of sabotage, theft, or use of a radiation source in an RDD or RED. The EPAct named 12 Federal agencies to the Task Force and named the NRC Chairman (or his designee) as its chair. The NRC also invited the U.S. Department of Health and Human Services and the Office of Science and Technology Policy to participate on the Task Force. A representative from the Organization of Agreement States and Conference of Radiation Control Program Directors was also asked to participate as a nonvoting member. The EPAct mandated that not later than 1 year after the date of the legislative's enactment, and not less than once every 4 years thereafter, the Task Force shall submit to the President and Congress a report providing recommendations, including possible regulatory and legislative changes, on several specific topics related to the protection and security of radiation sources.

Members of the Task Force

- Chairman of the Nuclear Regulatory Commission (Chair)
- Secretary of Homeland Security
- Secretary of Defense
- Secretary of Energy
- Secretary of Transportation
- Attorney General
- Secretary of State
- Director of National Intelligence
- Director of the Central Intelligence Agency
- Administrator of the Federal Emergency Management Agency
- Director of the Federal Bureau of Investigation
- Administrator of the Environmental Protection Agency

<u>Other Invited Agencies</u>

- Department of Health and Human Services
- Office of Science and Technology Policy
- Organization of Agreement States and Conference of Radiation Control Program Directors (non-voting member)

The Task Force provided its first report to the President and Congress on August 15, 2006 (hereafter referred to as the "2006 report") [NRC 2006c]. The Task Force concluded in the 2006 report that there are no significant gaps in the area of radioactive source protection and security that are not already being addressed. However, it did identify areas that need focused attention. As a result, the Task Force proposed 10 recommendations that would either require a policy, rule, or procedural change to implement, or require additional evaluation or study before a final recommendation could be made. The Task Force also identified 18 actions that did not

rise to the level of recommendations because they were underway or planned in the near term, but that were important to track and complete.

Following the issuance of the 2006 report and in an effort to continue the cooperation and coordination among Federal and State partners, the Task Force met periodically to discuss topics of interest, receive updates on activities being conducted by member agencies, and obtain status reports on the implementation of the recommendations and the actions listed in the 2006 report. In addition, the Task Force formed specific subgroups to address a number of recommendations and actions outlined in the 2006 report, including five studies in the areas of public education, alternative technologies, financial assurance for disused sources, feasibility of phasing out cesium-137 chloride salt, and reevaluation of radionuclides and threshold levels warranting enhanced protection. These analyses form the basis for many of the new recommendations, actions, and legislative changes proposed in this report.

The 2006 report presented the detailed background information that provides the basis for efforts that were established to address and resolve the issues it raised. The Task Force developed this 2010 report to provide an update on the progress made since the 2006 report and to propose new recommendations, including possible legislative and regulatory changes, in an effort to continue to improve the security of radioactive sources in the United States. This 2010 report offers a concise summary of activities, accomplishments, and new recommendations since the 2006 report. Similar to its process for developing the 2006 report, the Task Force formed 10 subgroups to evaluate progress made and identify any new recommendations in each of the topic areas specified in the EPAct.

This 2010 report is divided into four main topical areas: (1) coordination and communication improvements, (2) advances in the security and control of radioactive sources, (3) status of the recovery and final disposition of radioactive sources, and (4) progress in the area of alternative technologies. Within each of the topic areas, the “Accomplishments” section provides a detailed account of the key programmatic activities since 2006 and a status of the recommendations and actions from the 2006 report for each of the 10 topics identified in the EPAct. The “2010 Recommendations” section within each of the topical areas provides any new recommendations, including proposed legislative or regulatory changes, and explains the gaps these changes may fill in current processes or programs. Stakeholder interactions have played a key role in the Task Force’s analysis and development of certain recommendations, and the report highlights them when applicable. Lastly, a summary table at the end of this report compiles the 2006 recommendations and actions and the new 2010 recommendations. As the summary table indicates, 13 of the 2006 recommendations and actions have been completed. One additional 2006 recommendation is considered an “ongoing” activity, but has been completed for this 4-year cycle. Also, the activities associated with another 2006 recommendation will no longer be led by the Task Force due to a decision to transition those activities to another agency. Therefore, this recommendation could be considered completed even though the Task Force plans to follow progress made with regard to this recommendation. This report maintains the numbering scheme for the 2006 recommendations and actions; however, because this report is structurally different from the 2006 report (4 main topical areas rather than 10 as in the 2006 report), the 2010 recommendations employ a new numbering scheme. This numbering scheme is intended to be much simpler because it does not associate the recommendations and actions by topic areas. Also, for simplicity sake, the Task Force is calling all the new activities highlighted in this 2010 report “recommendations” rather than differentiating between “actions” and “recommendations.” The Task Force intends to continue to meet to implement and monitor the progress of these recommendations and actions and to identify any additional gaps that may arise in the years to come.

Chapter 1
Coordination and Communication Improvements

Government Coordination and Public Education

Since 2006, coordination efforts among Federal agencies, State governments, and international partners have significantly improved in assessing security programs and making risk-significant radioactive sources more secure and less vulnerable to use by terrorists. A number of forums for enhancing communication and fostering good working relationships on radioactive source security issues have been established or have bolstered their efforts. The enhanced interagency relationships have allowed for the successful implementation of a number of activities.

Accomplishments

- √ Task Force activities have been the primary vehicle for advancing issues relating to the domestic security of radioactive sources from potential terrorist threats. Over the past 4 years, the Task Force has routinely met, at least twice a year, to monitor and discuss the progress made on the recommendations and actions presented in the 2006 report.

- √ Through the U.S. Department of Homeland Security (DHS), the Nuclear Government Coordinating Council (NGCC) and the Nuclear Sector Coordinating Council (NSCC) have established three sealed source security focus groups under the auspices of the Critical Infrastructure Partnership Advisory Council to provide a forum for interagency and public-private sector interactions on sealed source security. These focus groups are on the topics of (1) transportation of radioactive materials, (2) tracking of radioactive sources, and (3) removal and disposition of disused sources.

- √ The trilateral agencies (U.S. Nuclear Regulatory Commission (NRC), DHS, and the U.S. Department of Energy (DOE)/National Nuclear Security Administration (NNSA)) conduct periodic meetings with senior management to enhance coordination.

- √ Several Federal agencies collaborated to develop classification guidelines for studies, exercises, and real-world incidents involving radiological dispersal devices (RDDs) and radiation exposure devices (REDs). The guidelines address RDD/RED design, materials used, contamination patterns, economic and other impacts, cleanup, and long-term recovery and provide consistent guidance across the Government on the classification of information about RDDs and REDs.

- √ In cities and communities across the nation, U.S. Government agencies, first responders, law enforcement personnel, and health agencies coordinate and participate in various response exercises to test, evaluate, and improve their ability to investigate and respond to terrorist attacks, including those involving nuclear/radiological materials. Thousands of Federal, State, territorial, and local responders engage in these types of exercises as part of a robust, full-scale, simulated response to a multifaceted threat. On a smaller scale, exercises at selected facilities, which are cosponsored by the Federal Bureau of Investigation (FBI) and DOE/NNSA, provide no-fault, site-specific scenarios where senior managers from various Federal, State, and local organizations can practice

their crisis and consequence management skills in response to a simulated terrorist incident.

√ In coordination with the NRC and Agreement State regulatory bodies, FBI has initiated visits across the Nation to certain possessors of risk-significant radioactive sources. These visits establish communications and give an understanding of the current security arrangements and how and when law enforcement should be engaged if there was a threat or event at these sites.

√ Agencies have conducted public meetings and outreach efforts since 2006 on major topical areas addressed in this report, such as cesium chloride and the National Source Tracking System.

√ The interagency Nuclear Security Subcommittee facilitates communication and coordination within the U.S. Government on nuclear security issues and activities being carried out by the International Atomic Energy Agency.

√ The Nuclear Smuggling Outreach Initiative (NSOI) and related Preventing Nuclear Smuggling Program (PNSP) were established to enhance international cooperation to combat smuggling of nuclear or highly radioactive materials. NSOI works with key countries around the world to develop joint action plans to enhance their capabilities to prevent, detect, and respond to incidents of illicit trafficking of such materials. NSOI also works with the international community of donors to secure and coordinate assistance to support implementation of the joint action plans. The PNSP focuses on increasing foreign governments' capability to respond to incidents of illicit trafficking in nuclear and radioactive materials by ensuring that all of a country's agencies involved follow a single set of well-exercised national operating procedures. The PNSP is also dedicated to promoting nuclear forensics, which plays a critical role in helping governments address a range of national security priorities (e.g., investigating and prosecuting illicit uses of nuclear or radioactive material) and provides a basis for international cooperation.

2006 Recommendation 4-1: The Task Force recommends that there be a coordinated public education campaign (Federal, State, and industry) to reduce fears of radioactivity, diminish the impact of a radiological attack if one were to occur, and provide a deterrent to attackers considering the use of radiological materials.

Status: Transitioned from the Task Force to the Federal Emergency Management Agency (FEMA).

In 2007, the Task Force formed the Public Education Subgroup to examine the issues related to educating the public on various radiation and RDD topics. The results of the examination were translated into an action plan that was endorsed by the Task Force.

The goal of the action plan was to achieve the following objectives: increase public safety in the event of a radiological attack, diminish the impact of a radiological attack, and speed recovery after a radiological attack. After a broad review of radioactive materials, consultations with experts, and considerable deliberation, the subgroup formulated 10 recommendations and identified seven projects, listed in Table I, to carry out the public education program.

Table I: Seven Projects of the Public Education Action Plan

Project Number	Title
1	Assessing and Improving Public Awareness of Radiological Terrorism
2	Comprehensive Guide to Existing RDD Public Education Resources
3	Identify, Prepare Resources for, and Train Regional and Local-Level Spokespersons
4	Identify and Prepare Resources for National-Level Spokespersons
5	Prepare a Generic RDD Annex for Crisis Communication Plans
6	Engage the Public, Emergency Planners, and Responders in a Discussion of Radiation and Risk in the Context of the Protective Action Guides
7	Peer Review of the Products of Projects 1 through 6

In 2009, the Task Force established the interagency Public Education Steering Committee to oversee the implementation of these projects. Progress has been made on two of the projects. Project 2, which is viewed as the first step in the public education campaign, was completed in January 2010 with the delivery of a comprehensive compendium of existing resources suitable for use in a public education campaign. Project 6 has been initiated and is expected to be completed in October 2010. Beyond the established seven projects, the Task Force recognized that since the 2007 timeframe, Federal and State agencies have made progress on other initiatives that support public education outreach, but that are not directly related to the plan. Federal and State agencies have completed research, written policy and planning documents, established communications networks, provided outreach to responders on the DHS Protective Action Guides for RDD and improvised nuclear device events, and developed communications material and messages for use by all levels of government to prepare for and respond to a radiological or nuclear emergency.

As an outcome of coordination efforts between the Task Force and FEMA, it was agreed to transfer all of the public education outreach initiatives to FEMA, the lead for the U.S. Government in public communication on issues related to radiation and other hazards. The Task Force's Public Education Steering Committee disbanded upon transfer of the public education outreach initiatives to FEMA. Therefore, the Task Force will no longer pursue the projects outlined in the plan; however, FEMA will consider them as they are pursuing their own mission in this regard. The Task Force continues to support FEMA's progress on this campaign and desires to stay apprised of developments.

2006 Recommendation 4-2: The Task Force recommends that the Federal agencies and States continue efforts to improve coordination and communication of their ongoing activities in the area of radiation protection and security for Category 1 and 2 sources.

Status: Ongoing.

As stated above in the list of accomplishments, significant improvement in interagency, State, and stakeholder communication and cooperation has been achieved. However, the Task Force

will continue to monitor these cooperative efforts, such as progress made by the DHS NGCC and NSCC sealed source security focus groups and trilateral agencies, to ensure coordination continues.

2010 Recommendations

None.

IAEA Category 1 and 2 Radioactive Sources

The United States, along with 100 other nations, has made a political commitment to following the International Atomic Energy Agency (IAEA) Code of Conduct on the Safety and Security of Radioactive Sources (Code of Conduct) [IAEA 2004]. The non-legally binding Code of Conduct contains basic principles for the safe and secure management of radioactive sources throughout their lifecycle. It lists 26 radionuclides and identifies three threshold activity levels for each, referred to as Categories 1, 2, and 3. These levels are based upon the relative health hazards each radionuclide would present if not kept under adequate controls. Sixteen of these radionuclides are commonly used in radioactive sources; the other 10 are unlikely to be used in individual sealed sources with activity levels that would place them within Categories 1–3. The Category 1 and 2 quantities of radioactive sources listed in the Code of Conduct are considered the most risk significant and have been the focus of Federal and State efforts to place tighter controls for security. Unless otherwise noted, throughout this report, the terms Category 1 and Category 2 sources refer to the 16 radionuclides listed in Table II. Note that the table provides the associated Category 2 quantities for the radionuclides. The Category 1 quantities are 100 times the quantities listed in the table.

Chapter 2
Advances in the Security and Control of Radioactive Sources

The regulatory authority and oversight of radioactive materials in the United States continues to expand due to the potential use of these materials by terrorists and thus more focused attention on security and control of these materials. Several U.S. Government agencies have various roles regarding the security and control of Category 1 and 2 quantities of radioactive material.

I. Reevaluation of Radioactive Source Lists

In 2007, the U.S. Department of Homeland Security (DHS) requested that the Task Force reevaluate the list of risk-significant radioactive sources and the associated threshold quantities that warrant enhanced security and protection [Chertoff 2007]. Also, in 2008, the National Academies recommended that "[f]or prioritizing efforts to reduce risks from malicious use of radiation sources, the U.S. Nuclear Regulatory Commission (NRC) should consider radiation sources' potential to cause contamination of large areas resulting in economic and social disruption (area denial) to determine what, if any, additional security measures are needed" [NA 2008]. The Task Force reevaluation considered consequences of concern beyond prompt fatalities and deterministic effects (based on the Code of Conduct) to include economic, social, and psychological consequences, with consideration of radioactive materials worldwide. The reevaluation was also integrated with the actions of the DHS National Infrastructure Protection Plan (NIPP) [DHS 2009c]. The purpose of this analysis was to reevaluate and identify radionuclides and their associated quantities that pose a significant risk if used malevolently in a radiation exposure device (RED) or radiological dispersal device (RDD) attack. This analysis purposely did not evaluate whether additional security and protection are needed above the existing regulatory requirements and voluntary enhanced security and protection measures that are already in place or being implemented.

Accomplishments

2006 Recommendation 3-1: The Task Force recommends that the U.S. Government periodically reevaluate the list of radioactive sources that warrant enhanced security and protection to assess their adequacy in light of the evolving threat environment [and consistent with current national consequences of concern in order to provide a consistent level of protection with other critical infrastructure].

Status: Ongoing; reassessed in 2009 as part of periodic reevaluations, with consideration of amended bracketed text.

The Task Force's reevaluation of the list of radioactive sources that warrant enhanced security and protection focused primarily on economic consequences and expanded its scope to address all radioactive materials worldwide. The Task Force evaluated consequences consistent with the NIPP Strategic Homeland Infrastructure Risk Assessment consequences [DHS 2008, 2009a]. Changes in the consequences of concern can affect not only protective strategies but also the list of radioactive materials and quantities of concern. Therefore, for consistency with other critical infrastructure sectors, the Task Force modified 2006 Recommendation 3-1 to align with NIPP methodology.

The Radiation Sources Subgroup analysis achieved three objectives: defining a significant RED and RDD, identifying radionuclides of greatest concern, and defining radioactive material quantities of concern sufficient to create a significant RDD and a significant RED.

Significant RED and RDD Definitions: The Task Force achieved Federal concurrence on the definitions of a significant RED and RDD.

These definitions of a significant RED and RDD are intended to provide the foundations for identifying and assessing potential hazards, determining what levels of relative risk can be adequately managed, and prioritizing and allocating resources to prevent and protect against radiological incidents. The reevaluation also supports the Federal risk-informed framework for the assessment of risk and management of homeland security activities, including decisions about when, where, and how to invest in resources that eliminate, control, or mitigate risks.

> *Significant RED: An object used to maliciously expose people, equipment, and/or the environment to ionizing radiation, without dispersal of the radioactive material, that could cause debilitating injury to people exposed for a period of minutes to hours, or could be fatal to people exposed for a period of minutes to days.*

The definition indicates that of paramount concern is the need to protect people against exposure to doses that are life threatening or that could cause a permanent injury that would reduce the quality of life. It aligns with the Code of Conduct Categories 1 and 2.[2]

> *Significant RDD: The combination of radioactive material and the means (whether active or passive) to disperse that material with malicious intent, without a nuclear detonation, that could (1) impact national security, national economy, national public health and safety, or*

[2] It could possibly be fatal to be close to Category 2 quantities of unshielded radioactive material for a period of hours to days. Larger sources could create similar exposures at longer distances and/or in shorter times.

any combination thereof or (2) require a robust, coordinated Federal response to save lives, minimize damage, and/or provide the basis for long-term community and economic recovery (which includes the cost for decontamination and environmental cleanup efforts).[3]

The definition includes impacts that could affect the national security, national economy, and national public health and safety. The definition also includes significant economic costs that could be incurred by Federal response efforts needed to save lives, as well as for decontamination and environmental cleanup needed to restore the community and local economy. The analysis considered the principal consequence of an RDD to be economic loss, the amount of which is primarily driven by time-consuming and costly decontamination and environmental cleanup efforts, which are highly dependent on the cleanup level selected. In responding to and recovering from radiological incidents, the Federal Government will provide assistance when needed, through the Robert T. Stafford Disaster Relief and Emergency Assistance Act [Stafford Act 2007], to support State and local efforts. The need for a robust, coordinated Federal response to support State and local efforts in providing for long-term community and economic recovery is indicative of significant economic consequences.

With the above definitions, Federal policy makers will have a common understanding of what constitute nationally significant[4] consequences and the quantities of radioactive material needed to achieve those significant consequences from an RED or RDD attack. The definitions are to be used as guidance for prioritizing and allocating Federal resources in developing appropriate protective strategies to prevent and protect against malevolent radiological incidents.

Radionuclides of Greatest Concern: The Task Force identified, through a five-step, down-selection process applied to 3,715 known nuclides, a list of 14 radionuclides of greatest concern for RDDs. These 14 radionuclides are commercially available to end users in quantities that could potentially be used in a significant RDD and are a subset of the radionuclides covered in the Code of Conduct. They are americium (Am)-241, californium (Cf)-252, curium (Cm)-244, cobalt (Co)-60, cesium (Cs)-137, iridium (Ir)-192, polonium (Po)-210, plutonium (Pu)-238, Pu-239, radium (Ra)-226, selenium (Se)-75, strontium (Sr)-90, thulium (Tm)-170, and ytterbium (Yb)-169. While Po-210 was identified through the down-selection process because it is commercially available to end users in quantities that could potentially be used in a significant RDD (i.e., greater than 0.1 Ci for alpha sources), Po-210 is listed below the dotted line in Table I of the Code of Conduct because it is very unlikely to be used in individual radioactive sources with activity levels that would place it within Categories 1 or 2. Therefore, Po-210 was included in Table III rather than in Table II.

Through this analysis, the Task Force also found that seven additional radionuclides could be of concern in limited situations when aggregated or in bulk quantities (e.g., at major and secondary suppliers and manufacturers). These seven additional radionuclides are iron (Fe)-55, carbon (C)-14, Sr-82, iodine (I)-125, I-131, tungsten (W)-188, and gadolinium (Gd)-153. Of these seven, C-14, I-125, I-131, Sr-82, and W-188 are not listed in the Code of Conduct. Although

---

[3] For the purposes of this report, this means a device with sufficient radioactive materials to contaminate approximately 1 square kilometer (approximately 250 acres, or 0.386 square miles) of the environment to both the U.S. Environmental Protection Agency (EPA) and DHS/Federal Emergency Management Agency (FEMA) Protective Action Guides relocation guideline of 2 rem in the first year [EPA 1992; DHS/FEMA 2008].

[4] The use of the term "significant" is not meant to imply that any loss of life or economic damage would be considered "insignificant." Nor is its use intended to prejudge whether Federal response would be provided in any particular event.

Po-210 may be commercially available to end users only in small quantities, it could be of concern in limited situations when aggregated or in bulk quantities. Therefore, Po-210 was included in Table III rather than in Table II. Gd-153 is listed "above the line" in Table I of the Code of Conduct, but was eliminated in the last step of the down-selection process because it is not normally available to end users in large quantities. For consistency with the Code of Conduct, Gd-153 and promethium (Pm)-147 were retained in Table II.

Quantities of Concern: Through the consideration of a variety of studies, the Task Force assessed the quantities of radioactive material (i.e., identify consequences of concern) sufficient to create a significant RDD and a significant RED, with consideration of social, economic, and psychological consequences.

The Task Force determined that a significant RED is a concern because of its deterministic health effects (i.e., the ability to cause death or permanent injury). For this reason, it used the Category 2 levels as the threshold values above which (i.e., Category 1 and 2 quantities) radioactive material should receive enhanced protection to reduce the likelihood of being used in a significant RED.

The Task Force determined that a significant RDD is a concern because of its economic consequences since it has the potential to contaminate large areas of the environment and incur large cleanup costs. However, an RDD is unlikely to cause many prompt fatalities. The quantities of radioactive material sufficient to create a significant RDD are comparable to Category 1 and 2 quantities. The reevaluation concluded that the Category 2 threshold values are valid for determining the quantities of radionuclides that warrant enhanced security and protection to reduce the likelihood of a significant RDD. By warrants enhanced security and protection is meant enhanced in comparison to the security and protection applied to radioactive sealed sources before September 11, 2001.

In conclusion, based on the definitions, assumptions, and parameters used, the Task Force found that the Category 1 and 2 quantities remain valid for sealed and unsealed sources as the list and threshold levels of radionuclides that could result in a significant RED or RDD event and therefore warrant enhanced security and protection (Table II). Furthermore, because the reevaluation included unsealed material, the Task Force identified seven additional radionuclides (Table III) that may be of concern when aggregated; however, because they are infrequently shipped or possessed in quantities likely to cause a significant RDD event, at this time the Task Force proposes no recommendation about these radionuclides and enhanced security and protection.

Table II: Radionuclides that Warrant Enhanced Security and Protection

Radionuclide	IAEA Category 2 Threshold	
	(TBq)	(Ci)
Am-241	0.6	16
Am-241/Be*	0.6	16
Cf-252	0.2	5
Cm-244	0.5	14
Co-60	0.3	8
Cs-137	1.0	27
Gd-153 ***	10.0	270
Ir-192	0.8	22
Pm-147 **	400.0	11,000
Pu-238	0.6	16
Pu-239/Be*	0.6	16
Ra-226	0.4	11
Se-75	2.0	54
Sr-90 (Y-90)	10.0	270
Tm-170	200.0	5,400
Yb-169	3.0	81

* The Code of Conduct lists Am-241/beryllium (Be) and Pu-239/Be as distinct sources. The down-selection considered only the radioactive material.

** The down-selection did not identify promethium (Pm)-147 because it is not commercially available to end users in quantities that could potentially be used in a significant RDD (i.e., greater than 1 curie (Ci) (0.04 TBq) for beta/gamma sources). The reevaluation retained Pm-147 because it is included in the Code of Conduct.

*** Identified in the down-selection as not commercially available to end users in quantities that could potentially be used in a significant RDD, but could be of concern in limited situations when aggregated or in bulk quantities.

Table III: Radionuclides that Should Be Considered for Enhanced Controls

Radionuclide	IAEA Category 2 Threshold	
	(TBq)	(Ci)
Fe-55 *	8000.0	220,000
Po-210 **	0.6	16
C-14 *	500.0	14,000
Sr-82 *	0.6	16
I-125 *	2.0	54
I-131 *	2.0	54
W-188 *	10.0	270

* Identified in the down-selection as not commercially available to end users in quantities that could potentially be used in a significant RDD. However, they are very unlikely to be used in activity levels that would place them within IAEA Categories 1 or 2, but could be of concern in limited situations when aggregated or in bulk quantities.

** The down-selection process identified Po-210 because it is commercially available to end users in quantities that could potentially be used in a significant RDD (i.e., greater than 0.1 Ci (0.004 TBq) for alpha sources). However, it is very unlikely to be used in individual radioactive sources with activity levels that would place them within IAEA Categories 1 or 2, but could be of concern in limited situations when aggregated or in bulk quantities.

2010 Recommendations

2010 Recommendation 1: The Task Force recommends that U.S. Government agencies use the radionuclides and the associated Category 2 threshold quantities in Table II, "Radionuclides that Warrant Enhanced Security and Protection" (as shown on page 11 of this report), as the appropriate framework for considering which sources warrant enhanced security* and that they adopt the definitions for a significant RED and a significant RDD (as shown on page 8 of this report) for prioritizing and allocating resources to eliminate, control, or mitigate risks of malevolent radiological incidents. * By warrants enhanced security and protection is meant enhanced in comparison to the security and protection applied to radioactive sealed sources before September 11, 2001.

II. Security Measures and Initiatives

The NRC continues to strengthen security and controls for the risk-significant radioactive sources. These activities are founded in and consistent with the U.S. Government's political commitment to follow the Code of Conduct. In these activities, the NRC continues to coordinate in partnership with the Agreement States that regulate the possession and use of certain radioactive material pursuant to agreements between the NRC and the Governor of each State. The Agreement States regulate approximately 80 percent of the radioactive materials licensee community. Of the approximately 23,000 radioactive materials licenses in the United States, fewer than 10 percent (approximately 1,400 licenses) authorize possession of at least Category 2 quantities of radioactive materials.

Accomplishments

Security Requirements

- √ Since the initial issuance of the increased controls requirements in 2005 [NRC 2005b] to those licensees that are authorized to possess at least Category 2 quantities of radioactive materials, the Agreement States and the NRC have performed nearly 1,630 inspections. The increased controls have required licensees to upgrade their facilities and procedures to ensure detection and prevention of unauthorized access, advance coordination with local law enforcement, enhance security during transportation, and enhance accounting of applicable radioactive material. The increased controls also require licensees to establish trustworthiness and reliability standards in determining who should have unescorted access to the applicable radioactive material. The first round of inspections was completed within the original 3-year schedule, which ended in June 2009. The performance of the NRC and Agreement States in prioritizing and conducting the increased controls inspections continues to be verified through the routine Integrated Materials Performance Evaluation Program reviews. To date, the NRC and Agreement State Programs that have been evaluated have been found to be adequate and compatible.

- √ From 2007–2008, the increased controls were enhanced by additional requirements for fingerprinting and Federal Bureau of Investigation (FBI) criminal history records checks of all individuals with unescorted access to at least Category 2 quantities of radioactive material [NRC 2007a] to further improve the tools available to determine trustworthiness and reliability.

- √ The Transportation Security Administration (TSA) is proposing regulations for the transport worker identification credential under Title 49 of the *Code of Federal Regulations* (49 CFR) Part 1570, "General Rules," and 49 CFR Part 1572, "Credentialing and Security Threat Assessments" [DHS/TSA 2006], which would apply a systemwide, common credential for use across all transportation modes (air, land, and water).

- √ In January 2010, the NRC issued the "Non-Manufacturing and Distribution (non-M&D) Service Providers Security Order" [NRC 2010a] to resolve an inequity that this small community of licensees had identified following the issuance of the increased controls requirements. The NRC issued this new order to non-M&D service provider licensees in order to give them an opportunity to have the same unescorted access privileges as those M&D licensees that have complied with the M&D order. This new order provides non-M&D licensees the opportunity to perform similar trustworthiness and reliability determinations as the M&D licensees, as stipulated in the M&D order, allowing them to have unescorted access privileges at clients' facilities.

- √ The NRC and Agreement States have jointly initiated a new rulemaking for materials security regulatory requirements that reflects the experience gained through implementation of the increased controls and fingerprinting requirements. The objective of the proposed rule is to provide reasonable assurance of preventing the theft or diversion of Category 1 and 2 quantities of radioactive material for malevolent use. New requirements are proposed for background investigations and an access authorization program to ensure that individuals who have access to these materials are determined to be trustworthy and reliable. The proposed requirements would also establish physical protection systems to detect, assess, and respond to unauthorized access to at least Category 2 quantities of radioactive material. For transport of the radioactive materials, the new requirements would include recipient license verification; preplanning and coordination of shipments; advance notification of shipments; notification of shipment delays, schedule changes, and suspected loss of a shipment; and control and monitoring of shipments. The NRC will capture these new regulatory requirements in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 37 and will supersede the existing requirements imposed by orders, such as the increased controls and fingerprinting orders. The NRC made draft regulatory text available for public review [NRC 2009c]. The proposed rule was submitted to the Commission on December 14, 2009 [NRC 2009d]. On May 13, 2010, the Commission approved the proposed rule for publication in the *Federal Register* [NRC 2010d]. On July 14, 2010, the NRC published the draft guidance documents in the *Federal Register* for public comment [NRC 2010b].

Voluntary Security Enhancements

- √ The U.S. Department of Energy (DOE) National Nuclear Security Administration (NNSA) and DHS/Domestic Nuclear Detection Office (DNDO) (DHS/DNDO turned this effort over to DOE/NNSA in May 2009) initiated a new domestic security effort that further mitigates the potential threat of terrorists acquiring and deploying an RDD by building on the existing regulatory requirements and providing voluntary security enhancements. Under its Global Threat Reduction Initiative (GTRI) program and in cooperation with the NRC, DHS, and FBI, DOE/NNSA offers federally funded security upgrades based on best practices. When requested by a licensee, the GTRI works to assess existing security conditions, provide recommendations on security enhancements, and, when warranted, fund the procurement and installation of jointly agreed-upon security best practices,

including biometric access controls, door alarms, motion sensors, video assessment, remote monitoring systems, tamper-indicating seals, and area radiation monitors. These voluntary security enhancements complement and do not replace the NRC's increased controls requirements. These voluntary security enhancements are sound and provide best practices that further improve security above regulatory requirements. As of May 2010, the GTRI has completed voluntary security enhancements at 127 buildings containing radioactive materials.

√ DOE/NNSA offers specialized training for local law enforcement so they can better protect themselves and their communities when responding to alarms at facilities with radioactive materials. As of May 2010, the program has conducted 15 courses with 523 students for 50 licensees and their immediate off-site responders.

√ DOE/NNSA partnered with the FBI and coordinated with the NRC and Agreement States to host table-top exercises at selected facilities. The purpose was to provide no-fault, site-specific scenarios where senior managers from various Federal, State, and local organizations could practice their crisis and consequence management skills in response to a simulated terrorist incident. As of May 2010, 8 table-top exercises have been completed.

√ DOE/NNSA and DHS/DNDO worked with the principal manufacturers of cesium chloride (CsCl) irradiators to develop specialized in-device delay (IDD) hardening kits for the most widely used models of CsCl blood and research irradiators. The IDD kits make it more difficult for an adversary to illicitly access and steal the radiological source. The GTRI funds CsCl irradiator manufacturers to provide these hardening kits in coordination with the GTRI domestic security effort. As of May 2010, GTRI-funded CsCl IDD kits have been installed on 167 of the 834 devices within the scope of the initiative.

√ The NRC and Agreement States approved revisions to the Sealed Source and Device Registrations that permit installation of hardening at the point of fabrication. The manufacturers voluntarily committed to distribute new units in such hardened configuration beginning in the fall of 2009.

√ DOE/NNSA, under its GTRI Well-Logging Security Initiative, has partnered with the oilfield services industry to provide specific guidelines ("Best Practices"), "Security and Control of High-Activity Well Logging Sources Guidelines" [DOE, et al. 2008c], to enhance the security of well-logging devices, including deterrence, detection, delay, assessment, and response. The guidelines focus on sources stored at base camps, during transportation and in use at drill sites. A number of industry partners have voluntarily agreed to enhance the security of their well-logging sources to meet the recommendations in the guidelines and allow occasional visits by GTRI staff to review progress toward meeting the guidelines' recommendations.

2006 Action 3-1: The NRC should evaluate the need to reissue the Orders to the Manufacturing and Distribution Licensees to make sure no security issues have been introduced from the use of different units of radioactivity.

Status: Complete.

In October 2006, the NRC issued "Order Imposing Fingerprinting and Criminal History Check Requirements for Unescorted Access to Certain Radioactive Materials, and Modification of the Order Imposing Additional Security Measures to Manufacturing and Distribution Licensees" [NRC 2006b]. This order amended/updated some of the security measures imposed by a previous order to reflect that the primary values used for compliance with the security requirements are in terabecquerels to make sure no security issues have been introduced from the use of different units of radioactivity.

2006 Action 6-1: The NRC should expeditiously complete its implementation of the fingerprinting provisions of the EPAct for those applicants for and licensees with Category 1 and 2 quantities of radioactive material. The NRC should place a high priority on completing the EPAct Section 652 rulemaking. As part of the rulemaking, the NRC should require fingerprinting for any individual who could have access to Category 2 or above quantities of radioactive materials. The NRC should also require periodic reinvestigations of such persons.

Status: Ongoing.

The NRC has implemented its new fingerprinting authority provided by the Energy Policy Act of 2005 (EPAct) through the issuance of orders requiring fingerprinting and FBI criminal history records checks for access to Safeguards Information (SGI) and unescorted access to at least Category 2 quantities of radioactive materials for M&D licensees, large panoramic and underwater irradiators, and licensees transporting Category 1 quantities of radioactive material. The NRC and Agreement States issued requirements to other licensees requiring fingerprinting and criminal history records check for unescorted access to radioactive materials in quantities of concern. The NRC has completed revisions to 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements" [NRC 2008d] for access to SGI by a broad class of individuals as mandated by EPAct Section 652(B)(ii) which requires that no person may have access to SGI unless (1) there is "need to know," (2) the applicant has undergone an FBI criminal history check, and (3) the licensee has established the person's trustworthiness and reliability based on a background investigation of work history, education history, references, and credit history.

The NRC is in the process of completing the implementation of EPAct Section 652(B)(i)(II) through the proposed 10 CFR Part 37 rulemaking. This rule will establish the requirements for fingerprinting of individuals permitted unescorted access to radioactive material or other property that the NRC determines to be of such significance to public health and safety or the common defense and security as to warrant fingerprinting and background checks. In addition, the rule will incorporate a reinvestigation provision as part of the background investigation requirements. The finalization of this rulemaking, anticipated by 2013, will complete this action.

In implementing the EPAct's fingerprinting provisions for unescorted access to radioactive materials, the NRC developed procedures to implement a program in which a licensee designates an individual (a reviewing officer) who is responsible for reviewing the trustworthiness and reliability information (which includes the FBI criminal history records checks) to grant unescorted access to other licensee employees. In some cases, such as for human resources personnel, this reviewing officer does not require, or is not permitted, unescorted access as part of his or her job duties. As a result, the NRC's fingerprinting authority, as granted by the EPAct, does not extend to these reviewing officers. The importance to security of the positions filled by these reviewing officers makes it logical to give the NRC the legal authority to make them subject to fingerprinting requirements and the FBI criminal history records check. A proposed legislative amendment was submitted to Congress by letter from the

NRC in June 2008 to authorize the NRC to require such individuals to submit to fingerprinting requirements such as those applicable to individuals who have unescorted access to radioactive material or access to SGI [Klein, 2008]. This legislative proposal was not enacted; however, as noted in the Commission direction in SRM-SECY-09-0181 [NRC 2010d], the proposed 10 CFR Part 37 rulemaking is to include the Commission's requested statutory changes to the Atomic Energy Act of 1954 [AEA 1954] that would permit fingerprints of reviewing officials without unescorted access to radioactive material or to SGI.

2006 Action 6-2: The NRC should evaluate the feasibility of establishing a national database for materials licensees that would contain information on pending applications and information on individuals cleared for unescorted access.

Status: Ongoing.

The NRC has initiated a two-part analysis to evaluate the recommendation of a national database. The first part involves reviewing the current program and obtaining all related methods and tools for tracking personnel access status for applicants or licensees that may possess Category 1 and 2 materials, then establishing the current proposed process/system as the standard. The second part of the analysis will involve looking forward to recommend improvements to the standard and anticipating how such a proposal would contribute to deploying a system that is more robust, efficient, and inclusive for all licensees, Agreement States, and Federal entities to have access to such a database. Currently, the NRC is developing the Web-Based Licensing (WBL) system for the regulatory oversight of the licensing life cycle that includes applications, issuances, amendments, and terminations. This system may fulfill part of 2006 Action 6-2 by evaluating the feasibility of being able to provide licensees with information on pending applications. While completing this action, the NRC is in the process of evaluating current systems under development, like the WBL.

2006 Action 6-3: The NRC and DHS should enter into a memorandum of understanding to cover access to the SAVE database for materials licensees.

Status: Complete.

DHS administers the Systematic Alien Verification for Entitlements (SAVE) Web-based computer program [DHS 2009b]. The DHS SAVE program has two databases. One is the Basic Pilot Program, which verifies the identity of citizens and noncitizens. Users can query Social Security Administration and DHS databases by using an automated system to verify the employment authorization of all newly hired employees. Participation in the Basic Pilot Program is voluntary and free to participating employers.

DHS requires a memorandum of understanding (MOU) to access the Verification Information System portion of the SAVE program. The NRC executed a SAVE-related MOU with DHS in August 2003. The MOU established the terms and conditions for the participation of the NRC power reactor licensees in the SAVE program for verifying the immigration status of alien applicants for unescorted access to NRC-licensed reactor facilities. In 2008, the agencies revised the MOU to also provide NRC materials licensees with a vehicle to access the SAVE database. Agreement States may also implement MOUs with DHS to access the Verification Information System portion of the SAVE program for their materials licensees. However, this database does not provide materials licensees the more in-depth background check information

needed on individuals for trustworthiness and reliability determinations in accordance with current security requirements, such as the increased controls.

2010 Recommendations

2010 Recommendation 2: The Task Force recommends that the U.S. Government agencies should reevaluate their protection and mitigation strategies to protect against significant RED or RDD attack using both potential severe immediate or short-term exposure and contamination consequences to public health, safety, and the environment as the consequences of concern. Agencies should use the Task Force-endorsed definitions, radionuclides, and thresholds for a significant RED and RDD and the associated assumptions and parameters as common guidance in the assessment of risk and management of homeland security activities.

The Task Force completed an assessment developed in response to 2006 Recommendation 3-1 and described in Section I of this chapter. The assessment identified radionuclides and quantities that pose a significant risk if used malevolently in an RED or RDD attack based upon deterministic health effects and economic consequences. The new focus of the reevaluation was on economic consequences, consistent with the NIPP framework that assesses risk as a function of consequences, vulnerability, and threat. The economic consequences of an RDD are primarily driven by the costs to clean up the contaminated area. The Task Force did not evaluate whether additional security and protection are needed to protect against contamination and resultant economic consequences. It is now proposed that U.S. Government agencies should reevaluate their current strategies for protecting against a significant RED or RDD attack to also consider economic consequences (or economic losses).

III. Improvements to the Licensing Process

In December 2006, through the collaborative efforts of the NRC and Agreement States, the NRC issued final pre-licensing guidance for the possession of radioactive materials. However, in early 2007, the U.S. Government Accountability Office (GAO) completed a covert operation, wherein GAO posed as a legitimate company and applied for and received a NRC materials license using falsified information. GAO then altered the possession limits on the license using commercially available software and placed an “intent to purchase” order for moisture density gauges containing Cs-137 and Am-241, totaling 2.7 Ci (0.01 TBq) (Category 3 in aggregate) from two portable gauge distributors. Although the purchases were not actually made, GAO attorneys were satisfied that the transactions could have been completed. Concurrently, GAO attempted to obtain a similar license from an Agreement State, but withdrew the application request after the State expressed intent to perform a prelicense visit as part of its licensing protocol.

Following this event as well as other assessments identifying vulnerabilities in the NRC’s licensing of the possession and use of radioactive material, the NRC took immediate steps to address these vulnerabilities. These steps included the NRC immediately suspending its licensing program until additional measures could be put in place to ensure the validity of requests from new applicants to possess radioactive materials and performing a retroactive review of all licenses issued in the previous 18 months to ensure the validity of the requests.

In a July 2007 testimony [GAO 2007], GAO made three recommendations for the NRC to improve its radioactive materials licensing process: (1) improved pre-licensing guidance, including consideration of mandatory site visits for new applicants, (2) periodic oversight of

license application reviewers, and (3) improved measures to prevent license counterfeiting. In conjunction with the hearing, the Permanent Subcommittee on Investigations identified four additional recommendations to improve the NRC's materials program. The recommendations called for NRC to: (1) reexamine its apparent "good-faith" presumption, which assumes that applicants do not harbor malicious motives, in the licensing process; (2) physically inspect applicants' facilities before issuing licenses for Category 3 radioactive sources; (3) consider including Category 3 sources in the proposed National Source Tracking System (NSTS); and (4) quickly establish the planned WBL system. Based on the results of this event and these assessments, NRC took the actions described below.

Accomplishments

√ The NRC developed a comprehensive action plan to address needed changes in the process for issuing licenses for radioactive sources. The action plan was transmitted to the Commission on August 25, 2007 [NRC 2007b], and the Commission approved the action plan, with comments, on September 18, 2007 [NRC 2007c]. The NRC established three groups to assist in implementing the action plan and developing additional recommendations for improving the materials regulatory infrastructure. These groups are the Prelicensing Guidance Working Group, the Independent External Review Panel (IERP), and the Materials Program Working Group (MPWG). The action plan addresses the recommendations listed above and one recommendation that call for an external panel of experts (the IERP) to perform a comprehensive review of the NRC's licensing program.

√ In March 2008, the IERP made eight recommendations centered around three key themes: (1) suspension of the good-faith presumption, (2) elevation of the security program to be equal to the materials program in regard to health, safety, and the environment, and (3) development of an electronic means of license verification for use by the NRC, Agreement States, and licensees [NRC 2008c].

√ In September 2008, the Prelicensing Guidance Working Group revised existing 2006 prelicensing guidance [NRC 2006a] to require site visits for all "unknown" applicants and for all requests for authorization to possess Category 2 and above quantities of material. The guidance also calls for investigations into the legitimacy of all applicants through readily available means, such as Internet searches and business listings. This guidance was intended to determine the legitimacy of applicants and uses.

√ In October 2008, the MPWG identified strategies to mitigate security vulnerabilities and evaluated the efforts of the IERP.

√ The NRC initiated the development of an Integrated Source Management Program that will include information on all NRC and Agreement State licensees and more than 70,000 risk-significant radioactive sources (not managed by DOE) possessed by approximately 1,400 licensees. Integrating the three systems (the NSTS, WBL system, and License Verification System (LVS)) will provide the following benefits:

- It will make national radioactive source authorization, possession, and transaction information available to other government agencies with a role in the protection of the Nation from nuclear and radiological threats.

- It will provide licensees with the secure automated means to verify license information and possession authorization before initiating radioactive material transfers.

- It will enable users to monitor the location, possession, transfer, and disposal of their applicable risk-significant radioactive sources throughout the country.

- It will improve source accountability and give better information to decisionmakers, and it will detect and alert regulators to tracking discrepancies.

- It will modernize NRC licensing and inspection management systems.

√ As an integral part of the action plan, the NRC initiated the General License Rulemaking to reduce the chances for aggregation of generally licensed material into risk-significant quantities. The proposed rule (74 FR 38372, August 3, 2009) calls for limiting the quantity of radioactive material allowed in a generally licensed device [NRC 2009a].

2006 Action 4-1: The NRC should consider imposing additional measures to verify the validity of licenses, before transfer of risk-significant radioactive sources, on all licensees authorized to possess Category 1 and 2 quantities of radioactive material.

Status: Ongoing.

The NRC is committed to implementing the recommendations and strategies of the IERP and MPWG, as described above, in a manner that maintains a balance between enabling the safe use of radioactive material and a risk-informed, graded approach to establish appropriate controls for the possession of radioactive material. With the completion of the activities indicated in the action plan milestones, the NRC will accomplish its goal in addressing the vulnerabilities identified in its radioactive materials program.

2010 Recommendations

None.

IV. Tracking of Sources

Since 2004, the NRC has maintained an interim inventory of nationally tracked radioactive sources, which was an annual accounting of licensees' Category 1 and 2 sources. The EPAct required establishment of the NSTS, which supersedes the interim inventory. This computer system tracks the possession and transfers of risk-significant radioactive sources over the life cycle of the sources. The system improves the ability of regulators to detect and act upon inventory discrepancies, respond to emergencies, and verify legitimate import, export, ownership, and use of sources. The NSTS was deployed for licensee and regulator use in January 2009. The deployment of the NSTS is a major accomplishment in ensuring a greater accountability for risk-significant sources. The NRC's regulation in 10 CFR Part 20.2207, "Reports of Transactions Involving Nationally Tracked Sources," requires licensees to do the following:

- Have reported the licensee's initial inventories of Category 1 and Category 2 sources, as defined in Appendix E, "Nationally Tracked Source Thresholds," to 10 CFR Part 20, "Standards for Protection against Radiation," by January 31, 2009.

- Have begun reporting all related transactions (manufacture, transfer, receipt, disassembly, or disposal of sources of interest) to the NSTS by January 31, 2009.
- Verify (on an annual basis) the records in the NSTS and reconcile that information with the licensees' records.

Accomplishments

√ Approximately 1,400 licensees reported their initial inventories. On average, the system processes 150 transaction reports daily.

√ The NRC has done extensive outreach with Agreement States and licensees to ensure adherence to reporting requirements. Outreach included speaking at industry meetings, holding NSTS training sessions and workshops, launching an NSTS Web site and a blog for communications and feedback, and setting up a help desk to address user questions about reporting to the NSTS.

√ DOE established a policy in February 2008 for the reporting of certain radioactive sealed source information to a centralized system, the DOE Radiological Source Registry and Tracking (RSRT) system. This new DOE policy supports the U.S. policy to work toward implementing the Code of Conduct and the development and implementation of the NSTS. DOE Notice 234.1, "Reporting of Radioactive Sealed Sources," (expired but extended by DOE Notice 251.76) assigns roles and responsibilities for the reporting of radioactive sealed sources that are in the custody or possession of DOE, and establishes requirements for the inventory and transaction reporting of certain radioactive sealed sources to the RSRT with data verification [DOE 2008a]. DOE Notice 234.1 (expired but extended by DOE Notice 251.76) also establishes DOE agency responsibilities for inventory and transaction reporting of certain radioactive sealed sources to the NSTS. DOE transaction reporting to the RSRT commenced in 2009.

2006 Action 11-1: The Task Force encourages the NSTS Interagency Coordinating Committee to develop a procedure/policy with guidelines on how to handle both Government and non-Government requests for information in the NSTS.

Status: Complete.

A procedure for handling the Government and non-Government requests for NSTS information was developed. The NSTS Interagency Coordinating Committee was inactivated following deployment of the NSTS.

Given the sensitive nature of the information contained in the NSTS, the system is categorized at the highest level of information security according to U.S. Government guidelines for civilian information technology systems (as a Level 4 system according to the National Institute of Standards and Technology security categorization). Data is only provided to those persons who have established that they have a need to know and can protect the information. Guidelines were created for providing information to licensing agencies (for their licensees) and to licensees for their own data in the NSTS. The NRC processes requests from a licensee or a

member of the public for data for another licensee as a request under the Freedom of Information Act. For requests from other Government agencies, the NRC will provide the appropriate data on a need-to-know basis.

2006 Action 11-2: The NRC should consider programming the NSTS to provide automatic daily information to [U.S.] Customs [and Border Patrol] on import/export shipment notifications.

Status: Completion expected in 2011.

Because of the large number of system requirements, the NRC separated NSTS development into two software versions. NSTS Version 1 was deployed for use in January 2009. This version has the basic functionality for licensees to report transactions involving source manufacture, import, export, transfer, and receipt. In addition, licensees can update information on the source, including changing the location of use. Regulators can verify pending records, such as locations of use, license information, and make and model information. Reporting capability is limited; regulators have the ability to view and report inventory for their licensees.

NSTS Version 2, which is currently in development and planned for deployment in 2011, will include import/export consents and notifications, event-triggered alerts, extended licensee functions, automated system interfaces, full reporting and query capabilities, and the ability to download data for other Federal agencies. Before deployment of Version 2, the NRC will work with DHS/U.S. Customs and Border Patrol to ensure their objectives and needs are achieved. As the NRC develops the WBL system and the LVS, the NRC plans to also include input from U.S. Customs and Border Patrol about its needs for accessing licensing information at a national level.

2006 Action 11-3: The Task Force suggests that a comprehensive analysis be conducted on the inclusion of Category 3 sources in the NSTS.

Status: Complete.

In 2008, the NRC proposed [NRC 2008b] to amend its regulations (10 CFR Part 20 and 10 CFR Part 32, "Specific Domestic Licenses to Manufacture or Transfer Certain Items Containing Byproduct Material") to expand the NSTS to include additional licensees that possess sealed sources containing greater than or equal to one-tenth of Category 3 radioactive sources. This rulemaking effort, which included the development of a draft final rule, contained a comprehensive analysis of inclusion of Category 3 sources into the NSTS. Numerous public comments, including comments from the Agreement States, were received on the draft rule. A large number of comments objected to the expansion of the NSTS to include even Category 3 material. The main reason expressed in the comments for this objection was that this decision was premature since the NSTS had not yet been implemented and experience was needed on operation of this system before deciding to expand the system to include sources other than Category 1 and 2 sources. Another view expressed by the commenters was the inclusion of Category 3 sources would more than double the number of sources in the system and could deflect attention from the Category 1 and 2 sources. After consideration of the public comments and deliberation, the Commission did not proceed with issuance of the final rule to expand the NSTS. The findings from the analysis appear on the NSTS public Web site: http://www.nrc.gov/security/byproduct/nsts/nsts-expansion.html [NRC 2009b]. Although the NSTS is currently functional, significant changes are being developed to the system. As the

NSTS continues to operate and users gain more experience with the system, the NRC will assess the scope and functioning of the NSTS on an ongoing basis.

2010 Recommendations

None.

V. Transportation Security

Since 2006, a number of initiatives have been completed or are well underway to improve the transport security of radioactive sources.

Accomplishments

- √ In June 2008, TSA provided motor carriers and shippers with voluntary security measures pertaining to highway transportation of specific hazardous materials defined as highway security-sensitive materials, including Category 1 and 2 materials, and highway route controlled quantities as defined in 49 CFR 173.403, "Definitions" [DHS/TSA 2010].

- √ In response to two industry petitions from the Council on Safe Transportation of Hazardous Articles and the American Trucking Associations for rulemaking, the U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) initiated a project to reconsider and refine the list of hazardous materials for which security plans are currently required. The industry petitioners asked PHMSA to amend the security plan regulations (HM-232F, 73 FR 52558; September 9, 2008) to create a distinction between hazardous materials that "present a significant security risk while in transportation and the vast majority of hazardous materials that pose no significant security risk in transportation." On September 9, 2008, PHMSA published a notice of proposed rulemaking [DOT/PHMSA 2008b] suggesting revisions to the list of materials for which security plans are required.

- √ In November 2008, PHMSA, in collaboration with the Federal Railroad Administration and TSA, published a final rule [DOT/PHMSA 2008a] adopting provisions to enhance the safety and security of rail shipments of certain high-risk hazardous materials (HM-232E, 73 FR 72181; November 26, 2008).

- √ In November 2008, TSA published a final rule [DHS/TSA 2008] affecting freight rail shippers, receivers, and carriers of rail security-sensitive materials that include a rail car containing a highway route controlled quantity of a Class 7 (radioactive) material. The rule requires freight rail carriers and certain facilities handling rail security-sensitive materials to designate a rail security coordinator, report tank car location and shipping information to TSA upon request, report significant security concerns, and implement custody and control requirements in transit and at the shipping and receiving facilities. TSA considered Category 1 and 2 thresholds, but found them not to be the amount of radioactive material typically transported via the rail transportation system. Because of the higher quantities of radioactive material transported via rail per typical shipment, the more applicable highway route controlled quantities of Class (7) of radioactive materials were used as thresholds in the rulemaking.

Further, the existing hazardous materials transportation regulations required a notation on the shipping document that a shipment met the threshold for highway route controlled quantity, thus providing the rail carrier with a positive way to identify shipments that require special handling as a “rail security-sensitive material."

2006 Action 3-2: The Department of Transportation (DOT) should examine the use of the Code of Conduct Category 1 and 2 thresholds in domestic transportation regulations.

Status: Complete.

In September 2006, DOT published an advance notice of proposed rulemaking [DOT/PHMSA 2006] seeking public comment on its security plan requirements. On November 30, 2006, DOT hosted a public meeting to invite further comments and information concerning the types and quantities of materials that should be covered by the security plan rule. In September 2008, DOT issued a notice of proposed rulemaking [DOT/PHMSA 2008b] to modify its current security plan requirements governing the commercial transportation of hazardous materials by air, rail, vessel, and highway. For radioactive material, the notice proposed adoption of the security thresholds recommended by the Code of Conduct and contained in the Nuclear Security Series Guide, ‘‘Security in the Transport of Radioactive Material” [IAEA, 2008]. DOT, in consultation with TSA, developed a final rule to revise the list of materials subject to security planning. DOT published this final rule [DOT/PHMSA 2010] in March 2010.

2006 Recommendation 5-1: The Task Force recommends development of a Transport Security Memorandum of Understanding to serve as the foundation for cooperation in the establishment of a comprehensive and consistent transport security program for risk-significant sources.

Status: Completion expected in 2010.

The purpose of this memorandum is to delineate clear lines of authority and responsibility and promote communications, efficiency, and non-duplication of effort through cooperation and collaboration between the parties in the area of transportation security based on existing legal authorities and core competencies. The MOU has program elements that consist of: 1) risk assessments, 2) strategic planning, 3) standards, regulations, guidelines, advisories, orders, and directives, 4) technical support, 5) sharing information during emergency response, 6) legislative matters, 7) budget, 8) communications, 9) intelligence and information sharing, 10) background investigations, 11) research and development, and 12) coordination meetings. DHS, DOT, and the NRC expect to sign the MOU before December 31, 2010.

2006 Recommendation 5-2: The Task Force recommends that the U.S. Government evaluate the feasibility of using new and existing technologies to detect and discourage the theft of risk-significant radioactive material during transport. The evaluation should include the findings of operational testing of existing technologies offering enhanced security of motor carrier shipments of hazardous material; shipment tracking, including communication systems; radio-frequency identification; vehicle disabling technologies; and mobile and stationary radiation detection systems.

Status: Ongoing.

At DOE/NNSA, the GTRI and the Office of Nonproliferation Research and Development have established a transportation security test bed to evaluate the reliability, accuracy, and compatibility/interoperability of commercially available technologies. DOE established the test bed because experience with three GTRI pilot shipments highlighted problems with commercially available systems. Transportation security systems and components that provide enhanced tracking (truck, trailer, and package), communication, intrusion detection, and package condition (intact or not) are being evaluated for deployment on GTRI and commercial shipments to demonstrate their capabilities to commercial shippers and carriers. In the interim, the GTRI/Offsite Source Recovery Project has taken steps to voluntarily increase the security of its source recovery shipments beyond those required by regulation, such as a dedicated truck, near-real-time tracking, redundant communications, "run-flat" tires, secure transportation overpacks, and a driver duress button.

In July 2008, the Nuclear Sector Coordinating Council (NSCC) requested participants in a Sealed Source Security Workshop to prioritize and identify areas on which to focus the energy and resources of the Radioisotopes Subcouncil. In September 2008, the Workshop identified the transportation of sealed sources as one of three priority concerns.

In December 2008, the Nuclear Government Coordinating Council (NGCC) and NSCC, working under the auspices of the Critical Infrastructure Partnership Advisory Council framework, endorsed the creation of focus groups to coordinate research and report findings back to the NGCC and NSCC for further action, as appropriate. The objective of the Tracking of Radioactive Sources Focus Group, which includes members from both government and industry, is to assess various existing technologies that may be employed to track radioactive sources. The NGCC and NSCC also established the Removal and Disposition of Disused Sources and the Transportation of Radioactive Materials Focus Groups, which include representatives from across the radioactive sealed-source stakeholder community, including manufacturers, distributors, users, regulators, and other Federal, State, and local officials.

The Tracking of Radioactive Sources Focus Group's findings will be used to establish a common understanding of the relevant issues and capabilities, so as to facilitate further partnership among Federal, State, local, and private-sector stakeholders in the development and ultimate deployment, if appropriate, of practical, effective technologies to track radioactive sources during transport. Focus group members are presently developing a paper describing the pros, cons, and costs of relevant technologies that may be used for tracking conveyances, packages, or individual radioactive sources.

2006 Recommendation 5-3: The Task Force recommends that the U.S. Government immediately develop a strategy and take actions to address the security of international shipments of Category 1 and 2 radioactive sources that transit or are transshipped through the land territory of the United States.

Status: Ongoing.

As described in the 2006 report several Federal agencies have regulatory jurisdiction for transportation security of transshipments, including the NRC, U.S. Customs and Border Protection, DOT, TSA, the U.S. Coast Guard, and the U.S. Department of State. The Transshipment Transit Security Working Group was formed to evaluate this specific area and to develop a U.S. position that can be used in international negotiations.

In December 2008, the NGCC and NSCC established the Transportation of Radioactive Materials Focus Group with the following objectives:

- Develop a clear, concise, single message on the potential national security concerns associated with the transportation of Category 1 and 2 sources.
- Identify the relevant regulatory authorities and associated security regulations integral to the transportation of Category 1 and 2 sources.
- Reconcile and analyze, as appropriate, overlaps, gaps, and potentially inconsistent Federal transportation security regulations.
- Develop a clear, concise, single message on the potential national security concerns associated with the transshipment of Category 1 and 2 sources.
- Define the term "transshipment" and identify the relevant regulatory authorities and respective security regulations applicable to the transshipment of Category 1 and 2 sources.

The Transportation of Radioactive Materials Focus Group began meeting in February 2009 to develop a paper on all current transportation security regulations that the Nuclear Sector can use to inform stakeholders. The focus group is developing a commonly accepted definition of transit and transshipment and assessing the adjustments that may be warranted in Federal approaches to shipments of radioactive sources transiting or undergoing transshipment through the United States. The definitions of transit and transshipment have been established and the group has agreed on draft criteria to facilitate the analysis of overlaps, gaps, and potentially inconsistent Federal transportation security regulations between the various Federal agencies. In addition, the focus group has enabled the development of a MOU among the NRC, DOT, and TSA on roles and responsibilities in the regulation of radioactive materials transport.

2006 Action 5-1: The Transportation Security Subgroup should review the findings and conclusions of all research conducted on securing "high hazard" hazardous materials transport to determine if any of the measures should be applied to transport of risk-significant radioactive sources.

Status: Ongoing.

Learning from the results of the DOT Federal Motor Carrier Safety Administration's (FMCSA) Hazardous Materials Safety and Security Field Operational Test (http://www.fmcsa.dot.gov/safety-security/hazmat/fot/index.htm) [DOT/FMCSA 2010] and a series of DOE/NNSA security technology evaluation shipments, DOE/NNSA established the transportation security technologies test bed in 2009 at Oak Ridge National Laboratory. Also in 2009, DHS sponsored a demonstration of developing container tracking technologies at Sandia National Laboratories. As existing and emerging technologies are assessed, the Transportation Security Subgroup will consider measures needed to implement them as Federal requirements as appropriate.

2006 Action 5-2: DOT should evaluate the best practices from the high-threat urban area corridor assessments to determine whether it should incorporate any of the best practices into the requirements for security plans for high-risk radioactive material. DOT should also evaluate whether transport of lower risk radioactive material warrants a security plan or whether the transport could be exempted from some of the requirements.

Status: Complete.

DOT and TSA have completed their assessment of the vulnerabilities of transporting hazardous materials in high-threat urban areas. These assessments resulted in railroad companies voluntarily agreeing to implement 27 action items designed to improve the security of rail movements of hazardous materials in these areas. The action items address system security and access control as well as en-route security.

2010 Recommendations

None.

VI. Import and Export Controls

Since the 2006 report, the U.S. Government has continued to work actively to fulfill its G-8 Summit commitment and its political commitment to the IAEA Director General to act in accordance with the IAEA "Guidance on the Import and Export of Radioactive Sources" (Import/Export Guidance), issued March 2005 [IAEA 2005]. The U.S. Government was instrumental in developing this guidance, which represents the first international export control framework for radioactive sources, and in promoting its adoption. Successful implementation of the Import/Export Guidance has received considerable attention internationally because it provides the basis for improving the security of cross-border transfers of sources and preventing diversion, by means other than theft, of materials potentially usable in an RDD.

Accomplishments

- √ As of 2010, 58 nations have made a political commitment to act in accordance with the Import/Export Guidance, up from 20 nations in 2006.

- √ Several large international meetings convened with a focus on the Import/Export Guidance and on harmonizing the implementation of export controls. The United States convened an ad hoc meeting of the major supplier countries to consider what actions suppliers could take to further strengthen the international export control framework.

- √ IAEA General Conference resolutions included provisions that urged countries to implement the Import/Export Guidance, discouraged the export of sources as a means of disposal, and pressed countries to address obstacles to the return of disused sources to the supplier country.

- √ The NRC incorporated the Import/Export Guidance through a rulemaking [NRC 2005a], that became effective in 2005. Likewise, DOE issued an order [DOE 2008b] in November 2008 that is consistent with relevant guidance contained in the Code of

Conduct and Import/Export Guidance and outlines responsibilities and procedures for DOE elements and contractors conducting imports and exports of radioactive sources.

√ The U.S. Government has been instrumental in helping to develop and encourage the use of universal forms to streamline communication between importing and exporting countries.

√ In 2006, a U.S. interagency group established a process to assess whether a proposed export of Category 1 or 2 radioactive sources to a particular country will be inimical to the common defense and security.

√ The NRC issued a final rule in the summer of 2010 that eliminates specific licenses for the import of Category 1 and 2 radioactive sources (specific licenses are still required for exports), in light of enhancements made to the NRC's domestic regulatory framework.

√ The NRC established a memorandum of cooperation with the Canadian Nuclear Safety Commission and with the National Nuclear Energy Commission of Brazil for the import and export of radioactive sources. The NRC engaged with a number of other countries to develop similar approaches to carrying out export controls.

√ The NRC launched the NSTS in January 2009, to improve the tracking of sources that are imported into or exported from the United States.

2006 Action 10-1: The U.S. Government should continue the efforts to promote international harmonization of import and export controls for Category 1 and 2 radioactive sources.

Status: Ongoing.

As mentioned above, since 2006 the U.S. Government has made significant strides in promoting the establishment of an international export control regime for radioactive sources consistent with the Import/Export Guidance. The implementation and harmonization of this global framework is a major undertaking that will require ongoing attention and support from the U.S. Government. Sustained efforts are needed as countries around the world continue to establish and strengthen their regulatory infrastructure for the control of radioactive sources.

2006 Action 10-2: The U.S. Government should encourage suppliers to provide arrangements for the return of disused sources and examine means to reduce regulatory impediments that currently make this option unavailable.

Status: Ongoing.

One of the obstacles to returning disused radioactive sources to suppliers is the application of national laws that forbid the importation of radioactive waste. If the sources become designated as waste, these laws prohibit their reentry into the supplier country. The United States and many other countries do not declare a disused source to be waste until it has reentered the territory and has been determined to be waste (i.e., the source cannot practically or economically be reused or recycled). The United States is pressing for supplier countries whose national laws prevent the return of sources to a supplier to examine means to reduce these regulatory impediments.

Another obstacle includes the loss of Type B packaging status. Many of the Category 1 and 2 sources must be transported in Type B packages. In the United States, many of the Type B packages were designed several decades ago and do not meet new international standards. Internationally, the grandfathering clause for old designs expired in 2001. In the United States, Type B packages did not have to meet the new design standards until October 1, 2008. After that date, many of the existing Type B packages could no longer be used. While Type B packages that meet the new standards are available, they are expensive to either lease or buy, or are available only in limited quantities. In special circumstances when certificate holders have demonstrated that compensatory measures enable an existing Type B package to meet a level of safety at least equal to that required by regulation to ensure that radioactive material can be transported safely, the NRC and DOT allow limited continued use of such packages, while NRC staff complete the review and approval of replacement package designs. However, this is considered an interim solution until new Type B packages are certified and available. 2010 Recommendation 8 addresses this challenge.

The U.S. Government has succeeded in bringing broad attention to this issue through a number of interactions with the international community. For example, in September 2009, the U.S. Government successfully introduced a provision in the IAEA 53rd General Conference Resolution on Nuclear Security, Including Measures To Protect against Nuclear and Radiological Terrorism [IAEA 2009b] that "calls upon all States to identify secure storage and disposition pathways for disused radioactive sealed sources so that such sources in their territories remain under regulatory control, unless exempted from regulatory control, and further calls upon States to address obstacles to the return of disused sources to the supplier State." The United States also contributed to a similar provision in the Resolution on Measures To Strengthen International Cooperation in Nuclear, Radiation, Transport, and Waste Safety [IAEA 2009a] that calls for related measures, "particularly those encouraging States to facilitate the return of disused sources to suppliers, [and] to develop central storage or disposal facilities for disused or orphan sources which cannot be returned to suppliers…." Also, in May 2010, the United States convened a meeting of 12 supplier countries in Vienna, Austria to begin dialogue on their successes and challenges with regard to source repatriation. However, the action requires continued efforts to further examine the domestic regulatory landscape that hinders the return of disused sources to foreign suppliers and the loss of Type B packaging status. Chapter 3 of this report further discusses this challenge.

2006 Action 10-3: The Task Force suggests the use of education and the creation of incentives to discourage the export of used Category 1 and 2 radioactive sources as an alternative to disposal.

Status: Ongoing.

The implementation of export controls for radioactive sources has allowed for considerable progress on this action by permitting the NRC and regulatory bodies in other countries greater ability to screen sources to ensure that they are not being exported abroad as an alternative to disposal. Specifically, under the NRC's export licensing program, the importing country must consent to the import of a Category 1 source or device before shipment; pertinent documentation is required to demonstrate that the recipient has the necessary authorization to receive and possess the material; and NRC regulations exclude disused sources from the regulatory definition of radioactive waste and facilitate their return by allowing applicants to import using a general license to encourage the return of sources to the U.S. supplier.

To further these efforts, the NRC should evaluate, as part of its outreach efforts, raising this concern with its primary trading partners.

2006 Action 10-4: The U.S. Government should improve the interagency evaluation of recipient authorization and recipient country controls to prevent the fraudulent acquisition of risk-significant sources exported from the United States.

Status: Complete.

Since 2006, the process for interagency evaluation of recipient authorization and recipient country controls has been substantially refined and streamlined. On an annual basis, the NRC has sought views from the executive branch on proposed NRC procedures for addressing license applications from U.S. companies seeking to export Category 1 and 2 quantities of radioactive material abroad. Such requests are consistent with the NRC rulemaking on the export and import of radioactive material [NRC 2005a] that calls for the Commission, as appropriate, to seek the advice of the executive branch in assessing whether a proposed export of a Category 1 or Category 2 quantity of radioactive material would be inimical to the U.S. common defense and security. The finding of no inimicality is relevant to both the nuclear proliferation significance of exports and the related security concerns that potentially harmful radioactive material could be used for malicious purposes. The NRC license review process considers executive branch views when, among other things, establishing the duration of licenses issued for U.S. exports of radioactive materials. License authorizations are valid for varying periods, but they do not exceed 10 years duration.

The executive branch reviews now include clearances from a wide range of offices. The 2009 review included 16 offices within the interagency group, bringing additional expertise to the process and making greater use of U.S. Government resources to better understand the recipient country's security environment, the adequacy of its regulatory controls, and any potential security concerns that may arise during transport or at the end-use location. Executive branch views are based only on information currently available and views on exports to any particular country are susceptible to change as additional information becomes available.

2006 Action 10-5: [The] NRC should consider reevaluating the need for a specific license to allow the import of Category 1 and 2 radioactive sources to a U.S.-licensed user.

Status: Complete.

Since 2006, in light of enhancements made to the NRC's domestic regulatory framework, the agency reevaluated the need for a specific license for the import of Category 1 and 2 quantities of radioactive material to a U.S. licensed user. The NRC issued a final rule in the summer of 2010 that eliminates specific licenses for the import of radioactive sources. A specific license for the export of Category 1 and 2 quantities of radioactive material will still be required.

2010 Recommendations

2010 Recommendation 3: Contingent upon the availability of alternative technologies, the Task Force recommends that the NRC evaluate whether the export licensing for Category 1 and 2 CsCl sources should be discontinued, taking the availability of disposal capacity and the threat environment into consideration.

As a result of a 2-year study to evaluate the feasibility of phasing out the use of dispersible forms of CsCl in Category 1 and 2 quantities, in response to 2006 Recommendation 12-2, a comprehensive five-part approach was identified. One element of this approach addresses the import and export of radioactive sources. In particular, it recommends that the NRC initiate a rulemaking or other stakeholder outreach processes to discontinue authorizing the export of Category 1 and 2 CsCl sources as replacement sources and/or technologies become available. It also recommends that the NRC, in cooperation with the Agreement States and DHS initiate a dialogue with stakeholder communities to obtain their input. An example of such an outreach was the public workshop that the NRC held in September 2008 to solicit public input on major issues associated with the use of CsCl. The stakeholder feedback received indicated that near-term replacement of devices or CsCl sources in existing blood, research, and calibration irradiators is not practicable and would be disproportionately detrimental to patient health, longstanding research, and emergency response capabilities. Given the range of uses of CsCl, one solution cannot apply to all applications or to all licensees uniformly.

The NRC has found that the security of Category 1 and 2 CsCl sources is adequately protected under the current NRC and Agreement State requirements. In the event that the current threat environment changes such that the NRC and Agreement States would issue additional security requirements to apply appropriate limitations for the use of CsCl in its current forms or for its replacement with suitable alternatives, discontinuing export of these sources may be considered.

Any actions to discontinue export of these sources should be taken only after any actions taken in response to 2010 Recommendation 11 (dealing with discontinuing licensing) are considered.

Chapter 3
Status of the Recovery and Disposition of Radioactive Sources

Management of Disused Sources

The disposition of risk-significant radioactive sources that have reached the end of their useful service lives and have no economic value to their current owner (or for various reasons do not have a readily identifiable owner) is an important consideration in ensuring the protection and security of this material. Disposition options include storage, recycling, reuse, and disposal.

The ability to dispose of disused risk-significant radioactive sources in the United States is a complicated matter. Radioactive sources are either considered commercial or Federal, and are classified as low-level radioactive waste (LLRW). Pursuant to the Low-Level Radioactive Waste Policy Amendments Act of 1985 [LLRWPAA 1985], States or State Compacts must provide disposal capability for commercial Class A, B, and C LLRW (as defined by U.S. Nuclear Regulatory Commission (NRC) regulations), including sealed sources, generated within their borders. The U.S. Department of Energy (DOE) is responsible for the disposal of LLRW (including sealed sources) owned or generated by DOE. DOE is also responsible for disposal of GTCC LLRW (including sealed sources classified as GTCC LLRW) resulting from activities licensed by the NRC or Agreement States.[5] DOE sources or sources resulting from certain Federal activities can be disposed of at certain DOE radioactive waste disposal facilities in accordance with DOE policies and orders. Commercial sources (including discrete radium and accelerator-produced isotope sources) are regulated by either the NRC or Agreement States and face a somewhat more complex path to disposal, in part because of the different levels of radioactivity of the sources. Four other factors affecting the disposal of commercial sources are restrictions associated with the LLRWPAA, waste classification requirements, waste acceptance criteria, and cost. Also, as discussed in Chapter 2, the limited availability of certified Type B packages is another obstacle to the shipment of disused sources.

[5] Every year, thousands of sources become disused and unwanted in the United States. While secure storage is a temporary measure, the longer sources remain disused or unwanted the chances increase that they will become unsecured or abandoned. These sources have been the focus of much interagency attention from a national security standpoint since the publication of the 2006 report. However, in many cases, disposal pathways are not currently available for disused sealed sources (and there are restricted options for storage of no-disposal-pathway waste). Continued coordinated effort is needed to make sure that comprehensive, sustainable disposal pathways for all disused sealed sources are developed in the interest of national security. These concerns are specific to disposal of radiation sources and do not relate to the storage and disposal of other radioactive materials, such as spent nuclear fuel and high-level waste.

Removal and Disposition of Disused Sources—Problem Statement*

The lack of disposal pathways for radioactive sealed sources, which make up less than 1 percent of all low-level radioactive waste by volume and activity, poses a national security concern. During their service lives, these sources have numerous essential and beneficial medical, industrial, and research applications. However, due to their high activity and portability, some of these sources could be used either individually or in aggregate in radiological dispersal devices commonly referred to as "dirty bombs," resulting in economic impacts in the billions of dollars and significant social disruption. Every year, thousands of sources become disused and unwanted in the United States. While secure storage is a temporary measure, the longer sources remain disused or unwanted the chances increase that they will become unsecured or abandoned. Thus, permanent disposal is essential. However, only 14 States currently have commercial LLRW sealed source disposal access, and there are significant political, statutory, and regulatory challenges associated with the creation of commercial disposal access for the remaining 36 States.

**Sealed Source Disposal and National Security: Problem Statement and Solution Set*, Deliverable (Part 1) of the Removal and Disposition of Disused Sources Focus Group of the Radioisotopes Subcouncil of the NGCC and NSCC, December 9, 2009.

Disposal access, already a challenge before 2006, has diminished substantially since that time, and a comprehensive policy change is needed to overcome current barriers in the disposal framework. In July 2008, the commercial LLRW disposal site near Barnwell, SC closed to out-of-compact States, leaving licensees in the 36 States outside of the Atlantic, Rocky Mountain, and Northwest Compacts[6] without disposal access for Class A, B, and C disused radioactive waste (see Figure I on page 33). In addition, because of its relatively low activity limits, the Barnwell facility does not accept most Class B and C LLRW sealed sources even from Atlantic Compact States. Also, many of the risk-significant sealed sources qualify as greater than Class C (GTCC) LLRW, for which there is no current disposal capability. Under current regulations, GTCC waste would be disposed of in a geologic repository unless alternative methods of disposal are proposed to and approved by the NRC. DOE is responsible for developing the capability to dispose of these GTCC wastes from NRC licensees, in accordance with the LLWPAA.

Radioactive sources make up less than 1 percent of all LLRW by activity and volume. However, they represent a significant concern because most licensees now have no commercial disposal option other than indefinite storage of their disused or unwanted sealed sources. Each year, thousands of radioactive sources become disused. Although current Federal and State programs provide assurance for long-term storage, disposal is considered the most secure management approach.

The closure of the Barnwell waste facility to out-of-compact waste has also increased demands on Federal and State programs for the recovery of excess or unwanted sealed sources (i.e., the National Nuclear Security Administration (NNSA) Global Threat Reduction Initiative's (GTRI) Offsite Source Recovery Project (OSRP) and the GTRI-funded, Conference of Radiation Control Program Directors (CRCPD)-managed Source Collection and Threat Reduction (SCATR) Program) [CRCPD 2007]. Despite the increased demands on these effective programs, the

[6] States within the Atlantic, Northwest and Rocky Mountain Compacts include: Alaska, Colorado, Connecticut, Hawaii, Idaho, Montana, Nevada, New Jersey, New Mexico, Oregon, South Carolina, Utah, Washington, and Wyoming.

national system for the recovery of lost and stolen sources continues to be a cooperative and well-coordinated effort among the Federal Government, States, and private sector. As an example of the effectiveness of the national system for the recovery of lost and stolen sources, all of the of 23 Category 1–3 sources (zero Category 1, 17 Category 2, and 6 Category 3) lost during calendar years 2006–2009 were promptly recovered. The data revealed no identifiable patterns indicating the collection of radioactive sources for criminal uses.

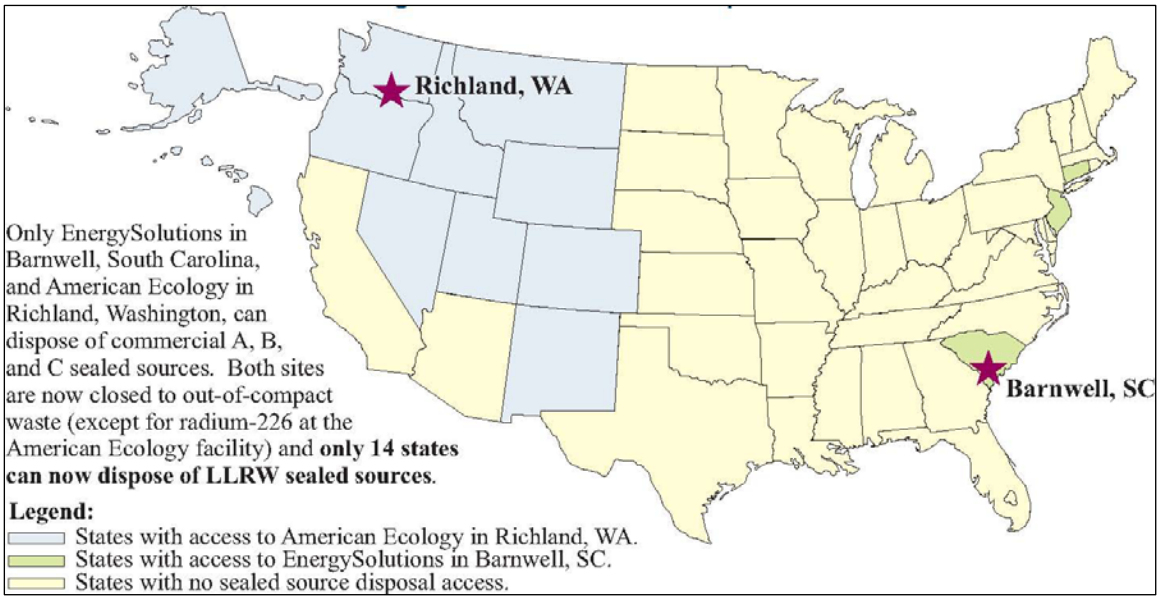

Figure I. LLRW Sealed Source Disposal

In response to the challenges of diminishing disposal capacity, some progress has been made in pursuing solutions. Final implementation of these ongoing efforts may ultimately require the highest levels of Government involvement, including congressional action.

Accomplishments

√ DOE determined that some sealed sources recovered by the GTRI/OSRP meet the criteria for disposal as DOE waste at existing DOE facilities. This reduced the backlog of recovered sealed sources in storage. However, there are some sources registered with the GTRI for recovery from U.S. owners that contain foreign-origin radioactive material (americium (Am)-241) that do not currently have a disposal path and recovery is severely constrained until a disposal path is available. This disposal challenge is exacerbated by the fact that the number of U.S. manufactured sources containing foreign-origin Am-241 radioactive material is increasing.

√ In 2009, the State of Texas licensed the construction of a new disposal facility to provide a disposal capability for certain classes of LLRW, including disused sealed sources for licensees in the Texas Compact (Vermont and Texas). This will be the first new facility to serve as a regional compact site since the passage of the LLRWPAA. Also in September 2009, the State of Texas licensed the construction of a facility for the disposal of Federal LLRW and mixed LLRW. It is expected that both facilities will be operational in 2011.

√ In September 2009, the GTRI, the DOE Office of Environmental Management, and the U.S. Navy successfully completed a multi-year effort to recover and dispose of all of the Navy's disused radioisotope thermoelectric generators.

√ Communication on the issue of sealed source disposition has been reenergized. In 2008, under the U.S. Department of Homeland Security (DHS) Nuclear Government Coordinating Council (NGCC) and Nuclear Sector Coordinating Council (NSCC), stakeholders across the sealed-source community, including manufacturers, distributors, users, storage providers, and disposal companies; regulators; other Federal, State, and local officials; and LLRW compact members convened to address the lack of commercial disposal options for sealed sources in the context of national security. Through the group's assessment and identification of disposal/management alternatives, ranging from recycle and decay in storage to a number of options involving existing and new Federal and commercial disposal facilities, the group concluded that secure storage provides a temporary measure; however, the longer sources remain disused or unwanted, the more chances increase that they will become unsecured or abandoned, as discussed in the Removal and Disposition of Disused Sources—Problem Statement at the beginning of this chapter.

√ Partly in response to the lack of disposal capabilities, Federal and State agencies and licensees have taken a number of actions to strengthen the security of sealed sources in storage. These actions include: reporting Category 1 and 2 sources to the NSTS; implementing security requirements for Category 1 and 2 materials (i.e., increased controls); implementing measures to minimize the production of LLRW for which there is no disposal option before considering extended storage in accordance with NRC Regulatory Issue Summary 2008-12, "Considerations for Extended Interim Storage of Low-Level Radioactive Waste by Fuel Cycle and Materials Licensees," issued May 2008 [NRC 2008e]; and implementing voluntary physical protection upgrades to certain devices, funded by the GTRI. These initiatives were created in part so that radioactive sources with no current disposal pathway are not lost or mishandled. Chapter 2 of this report provides a more detailed listing of related accomplishments.

√ CRCPD launched SCATR in 2006 based on funding from DOE. This program is designed to reduce the amount of unused radioactive material stored by radioactive material licensees. SCATR provides a financial incentive for licensees to remove unwanted radioactive material from long-term storage (see the "Long-term Storage" box on page 35) to proper dispositioning to reduce the risk of these sources being used for malicious intent. In addition, the GTRI has continued its source recovery activities implemented under the GTRI/OSRP. The total number of SCATR-eligible sources (i.e., beta/gamma sources less than 10 Ci) registered in fiscal year 2008 was 3,700, whereas in fiscal year 2009, 11,600 new SCATR-eligible sources were added. Overall, there are nearly 15,800 sources in the GTRI/OSRP database that would be SCATR-eligible if they were in States with access to commercial disposal. Although CRCPD, States, industry, and the GTRI have been engaged in efforts to facilitate the recycle or reuse of sources, the vast majority of sources registered in the database are not eligible for recycle or reuse. The GTRI/OSRP also received verbal requests for the recovery of approximately 2,000 small beta-gamma sources, which are yet to be registered, in fiscal year 2009. In addition, the GTRI/OSRP received several requests from State regulators to assist with either orphan sources or sources of regulatory concern. To date, the GTRI and its

partners have been able to recover more than 24,000 sources (more than 10,000 since 2006 alone) from more than 700 sites in the United States.

Long-Term Storage

Sources continue to remain in long-term storage because of a lack of a disposal path, particularly as a result of the limitations on disposal at compact facilities, or high costs.

With the combination of direct regulations concerning source storage, personnel protection regulations, guidance, and security requirements, along with the inspection and enforcement program and voluntary physical protection upgrades, there is reasonable assurance that the Category 1 and 2 sources in storage at facilities licensed by the NRC and Agreement States and at DOE facilities are safe and secure. However, disposal is considered the most secure long-term management approach.

2006 Recommendation 9-1: The Task Force recommends that the U.S. Government further evaluate the waste disposal options as outlined in the GAO reports on LLRW.

Status: Complete.

The Government Accountability Office (GAO) reported to the Senate in June 2004 [GAO 2004] on LLRW disposal availability. In this report, GAO identified the following three legislative options for addressing a potential shortfall in LLRW disposal availability that still apply to the current situation:

(1) Allow the current compact system under existing Federal legislation to adapt to the changing LLRW situation (i.e., maintain the status quo).
(2) Repeal the existing Federal legislation to allow market forces to respond to the changing LLRW situation.
(3) Use DOE disposal facilities for commercial waste.

GAO acknowledged the severe challenges to pursuing these three legislative options, even to the point of making the options untenable. The Task Force evaluated these recommendations and concluded that the current compact system is not providing adequate commercial disposal options for disused radioactive sources. Because the regional compacts were founded in Federal and State statutes, solutions must be fostered at the highest levels of Federal and State Government.

The GAO report and options informed the development of the list of options discussed in the Removal and Disposition of Disused Sources Focus Group. The focus group is still developing a messaging strategy and specific recommendations on potential solutions to the sealed source disposal concern to ultimately present to the DHS NGCC and NSCC. The Task Force will follow the progress made by and associated activities of the focus group. Likewise, the NRC is also gathering information to assess the effect of a lack of access to LLRW disposal facilities on those who use radioactive sources or materials in conducting research, such as universities and

hospitals. The NRC will use the information gathered from the various assessments in future decisionmaking on this issue.

2006 Recommendation 9-2: The Task Force recommends that the NRC evaluate the financial assurance required for possession of Category 1 and 2 radioactive sources to assure that funding is available for final disposition of the sources.

Status: Complete.

The NRC completed its evaluation of its financial assurance requirements, in consultation with Federal and State partners, in January 2010. The following options are being considered by NRC management in order to make a decision of whether to pursue rulemaking and the concomitant public consultation process. If a decision is made to pursue additional financial assurance, a rulemaking working group will be formed to develop a rulemaking plan and proposed rule. This initiative is being internally tracked by the NRC, outside of the Task Force.

Options considered in the evaluation include the following:

- Continue initiatives under the LLRWPAA that among other things, encourage regional compacts to site additional disposal facilities.

- Implement NRC risk-informed financial assurance requirements with lower financial assurance thresholds, where financial assurance would be required for smaller quantities of material than those stated in the NRC's current requirements. Additionally, update the dollar amount requirements for financial assurance to represent current disposal costs.

- Continue efforts among CRCPD, the States, and licensees that possess sources that are no longer in use to assist these licensees in locating other licensees that may be interested in accepting the disused sources as donations (e.g., academic institutions).

- Assess the appropriate enforcement actions such as determining the appropriate fines for licensees who do not properly dispose of sources; such efforts serve as a deterrent to licensees abandoning sources.

- Establish a "bottle deposit" system, where vendors would require a deposit before shipping radioactive material. When the source is no longer of use to the licensee, the licensee would return the source to the vendor. Upon receipt, the vendor would return the deposit. This system would act as an incentive for the licensee to return, rather than abandon, the disused source. Additionally, this would reduce the number of shipping containers needed.

2006 Action 9-1: The DOE should continue its ongoing efforts to develop GTCC disposal capability.

Status: Ongoing.

DOE has initiated the preparation of an environmental impact statement (EIS) to evaluate potential disposal options for GTCC LLRW. It issued a notice of intent to prepare the EIS in July 2007, followed by nine public scoping meetings from July through September 2007 to inform the

public and seek comments from communities that may host potential disposal alternatives. Background information about this effort can be found at http://www.gtcceis.anl.gov/ [DOE 2010]. DOE expects to issue the draft EIS in 2010 and will take into account any comments the Blue Ribbon Commission on America's Nuclear Future may provide on the draft in developing the final EIS. DOE expects to issue a final EIS in 2011. Pursuant to EPAct Section 631, before DOE can issue a final decision on its preferred disposal alternative for GTCC LLRW, it must first issue a report to Congress describing the disposal alternatives under consideration and await congressional action. Some alternatives may require legislative action to implement.

2006 Action 7-1: The NRC should evaluate requiring licensees to review and document the reasons for storage of risk-significant sources longer than 24 months and the feasibility of establishing a maximum time limit on the long-term storage of risk-significant sources not in use.

Status: Complete.

The NRC incorporated this action into its evaluation for 2006 Recommendation 9-2 in consultation with Federal and State partners. The evaluations will factor into the NRC's decision whether to pursue rulemaking and the public consultation process.

2010 Recommendations

2010 Recommendation 4: The Task Force recommends that the U.S. Government, regional compacts, and States continue to evaluate disposal options for disused radioactive sources, including options for handling a potentially large number of disused cesium chloride sources that may be replaced once viable alternatives are available.

The current compact disposal system is not providing disposal options for all generators. Potential disposal solutions will likely involve the highest levels of Federal and State Government, and could include actions by Congress to modify the existing legislative framework or actions within the existing legislative framework (e.g., States and licensees without disposal access requesting compact commissions and States hosting existing disposal facilities to grant an out-of-compact exemption for disposal of disused sources).

This recommendation follows on to 2006 Recommendation 9-1.

2010 Recommendation 5: The Task Force recommends that Federal and State Governments investigate options such as providing short-term secured storage of sources recovered from U.S. owners that contain foreign-origin americium-241 radioactive material, so that these sources can be recovered now, and increase efforts to investigate options for disposal of these sources.

An increasing number of U.S.-manufactured sealed sources (e.g., moisture gauges, oil well-logging devices) contain foreign-origin Am-241. These sources, when declared a waste, fall within the scope of the GTCC LLRW disposal project. These sources are currently stored securely at licensee sites, however, until a GTCC LLRW disposal capability is available, disused sources that contain foreign-origin radioactive material and are registered for recovery by the GTRI/OSRP have not been recovered because a disposal path has not been identified. The GTRI/OSRP's ability to store the sources it recovers is directly linked to the availability of disposal pathways. Both Federal and commercial storage facilities have been reluctant to

receive sealed sources recovered by GTRI/OSRP that have no disposal pathway. Therefore, this recommendation would help alleviate issues related to this type of material.

2010 Recommendation 6: The Task Force recommends that the NRC incorporate procedures to review the status, such as the date of, the reason for, and location of sources in long-term storage, in the current inspection program.

The intent of incorporating this review into the current inspection program is to be able to ascertain when a source goes from being an economic asset to a licensee to being disused and unwanted, with limited or expensive disposition options. Incorporating this review into the inspection program would provide a more accurate account of those sources in long-term storage and also give assurance that disused and unwanted sources are being adequately protected and secured.

2010 Recommendation 7: The Task Force recommends that the U.S. Government, in collaboration with responsible State agencies, evaluate and develop a plan to improve, as necessary, processes for dealing with unwanted, abandoned, or impounded sources, including storage, reuse, recycling, or other disposition methods.

In November 2009, CRCPD conducted an Internet survey of its members on topics related to the storage and disposal of sealed sources in the States. Twenty States responded to the survey. The survey provides initial data to understand the sealed source storage situation in the Nation. The respondents identified a variety of storage conditions. Most States reported that licensees store sources on site. Eight States reported that licensees are requesting licenses for the storage of sources only. Most States have had to deal with licensees that have abandoned sources or went into bankruptcy. Nine States responded that they have storage for orphan or impounded sources, but only one State reported that it had a facility to accept unwanted sources.

2010 Recommendation 8: The Task Force recommends that the U.S. Government enhance support of short-term and long-term research and development of certified Type B containers for use in domestic and international source recovery efforts.

As discussed in Chapter 2, many of the Category 1 and 2 sources must be transported in a Type B package. On October 1, 2008, a significant number of older design specification and performance-oriented Type B package certifications expired as the U.S. Government harmonized with international transport regulations. As a result, beginning in October 2008, only a very limited number of certified Type B packages were available for specific applications. To provide for an orderly transition, the U.S. Government has provided special permits and authorizations for continued use of the decertified packages on an as-needed basis where efforts include a good faith effort to transition to currently certified packages in the near future and an adequate safety case has been demonstrated. For example, the current special permit authorizing the extended use of the 20WC container was granted until June 30, 2010. This container is particularly critical to source recovery operations because it has broad application as a result of its non-device specific design.

For the long-term, the U.S. Government has procured vendor services for the design, development, testing and certification of a new Type B package to support the transportation of irradiators, teletherapy heads, or sources removed from these devices using remote handling capabilities such as the International Atomic Energy Agency's (IAEA) mobile hot cell. The

design of this new Type B container will be available to any company in the United States or abroad. Ideally, the broad availability of this design will foster a more competitive market and drive down transportation costs when it becomes available in 2013/2014.

In the short term, each year approximately 50 cesium-137 or cobalt-60 sources containing about 18,000 Ci are added to the list of unwanted sources needing recovery that require the use of a certified Type B package. This is in addition to the 126 sources totaling 75,600 Ci already registered as disused. This means that between June 30, 2010, when the 20WC special permit expired and 2014, when many new Type B packages are expected to be available, there could be about 240 sources totaling 93,000 Ci that will not be recovered unless other short-term options are identified.

Chapter 4
Progress in the Area of Alternative Technologies

Alternative Technologies

Radionuclides are used in a variety of beneficial and lifesaving applications in medicine, industry, and research. Concerns about the possible misuse of those radionuclides in malicious acts have led to the exploration of lower risk alternative technologies that could replace those radionuclides. While alternatives exist for some applications, financial, logistical, functional, relative risk, and disposal issues can impede the deployment of some alternatives and providing a replacement of the current operating technology.

Three types of alternatives could serve as replacements for risk-significant radionuclides: (1) technologies that use the same radionuclide with a different chemical or physical form (e.g., replacing cesium (Cs)-137 salt with less dispersible Cs-137 ceramic), (2) technologies that use a different radionuclide (e.g., replacement of Cs-137 salt with cobalt (Co)-60 metal), and (3) technologies that do not use a radionuclide (e.g., x-ray technology). Although alternative forms and radionuclides were assessed, further risk reduction might be achieved through alternative technology research and development that focuses on non-radioactive replacement (e.g., x-ray).

Cesium chloride (CsCl) has long received increased attention from both a safety and security perspective because of its potential dispersibility if removed from an irradiator or source capsule. Approximately 550 licensees in the United States possess about 1,100 self-contained CsCl irradiators, which contain at least a Category 2 quantity of radioactivity. The increased controls required by the U.S. Nuclear Regulatory Commission (NRC) and Agreement States and implemented by licensees, along with voluntary additional facility and device hardening measures, have substantively improved the security of these sources.

Since 2006, a number of initiatives helped direct the study of alternatives and alternative forms for Category 1 and 2 radioactive sources and the evaluation of the feasibility of phasing out CsCl in a highly dispersible form. Notably, in the National Academies' 2008 report entitled, "Radiation Source Use and Replacement," the National Academies examined a range of radionuclides and their applications [NA 2008]. Preparation of the report involved a number of public meetings and input from a wide range of stakeholders on radiation source use and replacement. The report's key recommendations include the following:

- Urge that the replacement of radionuclides with alternatives be implemented with caution to ensure that the essential functions are preserved.

- Implement, through U.S. Government action, the replacement of radioactive CsCl sources through options such as discontinuing the import and licensing of new CsCl irradiator sources, putting in place incentives for decommissioning existing sources, and prohibiting the export of CsCl sources to other countries, except for purposes of disposal in an appropriately licensed facility.

- Put in place, through U.S. Government action, incentives for research and development on alternative technologies.

- Develop a comprehensive, systematic approach across the U.S. Government to implement the recommendations.

In addition, the Federal Government took a number of actions, as described below.

Accomplishments

√ The U.S. Environmental Protection Agency (EPA) continued its voluntary Alternative Technologies Initiative that examines non-radionuclide alternatives. In October 2007 and July 2008, EPA held stakeholder meetings with the well-logging industry to understand the challenges and opportunities for alternatives in that application.

√ Between December 2007 and April 2008, the NRC conducted a series of visits to the manufacturers of CsCl irradiators and sources. A cohesive set of conclusions emerged from the manufacturers, including that, for development of high-activity sources using less soluble and dispersible forms of Cs-137, a significant research effort is needed; scaling up from current small activity levels may not be technologically successful; and, if security is to be enhanced, the NRC should work with the industry to identify cost-effective, feasible enhancements.

√ In September 2008, the NRC held a stakeholder workshop on security and the use of CsCl, during which, stakeholders indicated that replacement of devices or CsCl sources in existing blood, research, and calibration irradiators is not practicable in the near term and would be disproportionately detrimental to patient health, longstanding research, and emergency response capabilities. Details about the stakeholder workshop can be found at http://www.nrc.gov/materials/miau/licensing.html [NRC 2008a].

√ The NRC developed a strategy, regulatory options, and a recommended option for the security and future use of CsCl sources based on information gathered from staff analysis, stakeholder inputs, a public workshop, site visits, and other sources, which was transmitted to the Commission on November 24, 2008 [NRC 2008f]. The Commission approved the option to enhance security and issue a Commission policy statement, with comments, on April 15, 2009 [NRC 2009e]. Elements of the approval included working with Federal agencies on a comprehensive approach to improve the security of CsCl sources (with monitoring of the threat environment and implementation of physical security upgrades), the development of a strategy for end-of-life management of CsCl sources, short-term and long-term research, and development of alternative forms of Cs-137 and a definition of dispersibility.

On June 29, 2010, the Commission published the draft policy statement in the *Federal Register* for public comment [NRC 2010c]. It is the policy of the Commission that its mission of ensuring adequate protection of public health and safety, common defense and security, and the environment while enabling the use of radioactive materials for beneficial civilian purposes is best accomplished with respect to CsCl by implementing or promoting the following principles:

- The safety and security of risk-significant sources is an essential part of the NRC's mission;

- Licensees have the primary responsibility to securely manage and to protect sources in their possession from misuse, theft, and radiological sabotage;

- Adequate protection of public health and safety is maintained if CsCl sources are managed in accordance with the security requirements of the NRC and the Agreement States. These requirements are based on vulnerability assessments of the various sources and follow the principles of the Code of Conduct;

- While these sources are adequately protected under the current NRC requirements, design improvements could be made that further mitigate or minimize the radiological consequences;

- The development and use of alternative forms of Cs-137, while not required for adequate protection, is prudent and the NRC intends to monitor these developments closely. In addition the NRC recognizes that measures to verify effectiveness of the alternatives for solubility and dispersibility must be established to support future decision-making on this matter;

- CsCl enables three specific classes of applications that benefit society: (a) blood sterilization, (b) bio-medical and industrial research, and (c) calibration of instrumentation and dosimetry;

- The NRC recognizes that currently there is no disposal capability for such commercial sources. The NRC considers it imperative to develop a pathway for the long term storage and disposal of these sources whether or not there are alternatives developed; and

- The NRC monitors the threat environment and maintains awareness of international and domestic security efforts. In the event that changes in the threat environment necessitate regulatory action, the NRC is ready to issue additional security requirements to apply appropriate limitations for the use of CsCl in its current form.

√ In 2009, the National Nuclear Security Administration (NNSA) began research on non-radioactive alternative technologies for radioactive source applications. NNSA is fully coordinating research with the interagency and is carrying it out through the national laboratories and through the NNSA Small Business Innovation Research program. Projects for neutron generation well logging alternatives, development of non-radionuclide-based sources of high energy gamma rays and development of x-ray alternatives to Cs blood irradiators are currently the focus of NNSA's research and development efforts.

√ In 2009, NNSA completed an initial study to evaluate and quantify the relative risk reduction achievable by replacing current forms of radioactive materials with other forms or with other radionuclides. Federal policymakers may use the conclusions drawn to examine investment options/tradeoffs for determining whether to fund research and development on alternative radioactive materials/forms. Preliminary results suggest that risk reduction achieved from alternative forms or alternative radionuclides as replacements may not be enough to offset the cost to develop the new alternatives, and

the alternatives need to be weighed against other options in more detailed cost-benefit analyses.

√ The U.S. Department of Homeland Security (DHS) Domestic Nuclear Detection Office (DNDO) is supporting research on non-radioactive alternative technologies through its Small Business Innovation Research Program. In particular, this program evaluates a neutron generator that could replace americium-beryllium sources currently used in the well-logging industry. This program also aims to design and produce a compact linear electron beam accelerator that is capable of producing radiation that mimics the radiation from the most common radionuclide sources but poses no security risks.

2006 Recommendation 12-1: The Task Force recommends that the Alternatives Technology Subgroup evaluate financial incentives; research needs for both alternative technologies and alternative designs, including financial support; and the cost-benefit of potential alternatives for Category 1 and 2 radioactive sources.

Status: Complete.

In 2008–2010, an evaluation of alternative technologies was conducted for seven applications involving the most risk-significant radioactive materials. The evaluation included an assessment of financial incentives, research needs, and the life cycle operational costs of potential alternatives. The evaluation did not attempt to quantify the total cost to complete research and development of new alternatives or the recovery and disposal costs to remove the replaced sources. As part of this initiative, discussions were held with industry and government stakeholders and a lifecycle operational cost analysis of technologies was performed based on input from a small sample of stakeholders in each technology area reviewed. In-person focus groups for three industry practices (blood irradiator, industrial radiography, and well logging) were assembled in an effort to provide input to the evaluation. These focus group meetings proved effective, providing an opportunity to obtain the perspectives of both those who use the technologies and those who develop and manufacture them, such as researchers, developers and suppliers.

Generally, the analysis found that alternatives exist for some of the seven applications but that the viability, relative risk reduction, and stage of development of these alternatives vary. No alternative currently exists that is able to meet all user needs for any of the seven applications. Replacement of industrial sources (americium (Am)-241, Cs-137, Co-60, iridium (Ir)-192) must be addressed in terms of the field of application. Specifically, replacement may be feasible but requires further technological development for blood irradiation by x-ray technology and industrial radiography by ultrasound and x-ray technology. Further research is needed to establish feasibility for calibration irradiators, research irradiators, well logging, and panoramic irradiators. Although alternative forms and radionuclides were assessed, further risk reduction might be achieved through alternative technology research and development that focuses on non-radioactive replacement (e.g., x-ray). X-ray technologies were found to be cost competitive with radionuclide technologies on an annualized cost basis. Recent developments in x-ray technology may lead to mature and desirable alternatives in the near future. The study concluded that the successful replacement of the radionuclide technologies with alternatives will require different timetables for each application, need to be incentivized in many cases, and require a coordinated effort among a wide range of stakeholders. As mentioned previously, the availability of disposal pathways for radioactive sources must be considered before the widespread replacement of radioactive sources with alternative technologies can occur.

2006 Recommendation 12-2: The Task Force recommends that high priority be given to conducting a study within 2 years to assess the feasibility of phasing out the use of CsCl in a highly dispersible form. This study should consider the availability of alternative technologies for the scope of current uses, safe and secure disposal of existing material, and international safety and security implications.

Status: Complete.

In 2007–2009, a study was conducted to assess the feasibility of phasing out the use of CsCl in a highly dispersible form. Considering the results of the study and other input received, the Task Force concluded that an immediate phase-out of CsCl would not be feasible because the sources are used extensively in a wide range of applications in medicine, industry, and research, with significant health benefits to patients, and in the calibration of the national and international systems of radiation measurements. However, a gradual, stepwise phase-out could be feasible as alternatives become technologically and economically viable and if disposal pathways are identified. A number of challenges must be overcome to successfully implement this path forward, and the sequences and timeframes of implementation are critical. Sufficient time is required to develop replacement technologies for certain applications and to evaluate, consider, and where appropriate establish disposal pathways. Interim measures, such as enhancing the physical security of existing devices, would provide more effective protection of CsCl sources currently in use.

The path forward based on the study involves a comprehensive five-part approach for improving the security of and reducing the risks associated with sealed sources containing Category 1 and 2 quantities of dispersible CsCl for the short term as well as for the long term, including:

- *Continue to implement security upgrades to supplement existing requirements and establish a process for determining additional future upgrades.* The ongoing NNSA domestic voluntary security enhancement program, which includes the in-device delay effort, is already addressing this element. As such, this element does not appear as a separate action item in this report.

- *Initiate rulemaking or other processes, which should include stakeholder input to (1) eliminate further licensing, and (2) ban the export of CsCl sources.* The Task Force notes that, while it is prudent to continue to look for viable alternative technologies and sources, a decision on whether to discontinue NRC and Agreement State licensing or export of new CsCl sources containing risk-significant quantities of radioactive material should be based primarily on the existence of viable alternative technologies and disposal capacity. Therefore, the Task Force concludes that it is premature to recommend initiating rulemaking or other processes to eliminate further licensing and export of CsCl sources. The NRC has found that current security of these risk-significant sources is adequate based on the actions taken to enhance security to date.

- *Consider developing a Government-facilitated disposal pathway.* 2006 Action 9-1 contains this element.

- Investigate options such as *prioritized Government-incentivized replacement of devices with existing, effective alternatives.* 2010 Recommendation 10 contains this element.

- *Support short-term and long-term research and development for alternative technologies.* 2010 Recommendation 9 contains this element.

2010 Recommendations

The Task Force has identified a number of recommendations to achieve risk reduction by using alternative technologies in place of radioactive sources.

2010 Recommendation 9: The Task Force recommends that the U.S. Government enhance support of short-term and long-term research and development for alternative technologies.

The Task Force recommends that the technology and user communities collaborate closely to determine the viability of using existing or developing technologies as replacements for International Atomic Energy Agency (IAEA) Category 1 and 2 quantity sources of Am-241, Cs-137, Co-60, and Ir-192.

2010 Recommendation 10: The Task Force recommends that the U.S. Government, contingent upon the availability of alternative technologies and taking into consideration the availability of disposal pathways for disused sources, investigate options such as a voluntary prioritized, Government-incentivized program for the replacement of Category 1 and 2 sources with effective alternatives, with an initial focus on sources containing CsCl.

The Task Force recommends that the U.S. Government investigate options such as a program to incentivize the early decommissioning and replacement of Category 1 and 2 sources with viable alternatives, where available. The availability of a disposal pathway for existing Category 1 and 2 sources is an important consideration for the secure replacement of these sources. If such a program is implemented, the Task Force recommends that the Government conduct it in a prioritized fashion with targeted replacements. For example, the Task Force suggests putting urban, densely populated areas at a higher priority.

2010 Recommendation 11: Contingent upon the availability of viable alternative technologies, the Task Force recommends that the NRC and the Agreement States review whether the licensing for new Category 1 and 2 CsCl sources should be discontinued, taking the threat environment into consideration.

The NRC has found that the security of Category 1 and 2 CsCl sources is adequately protected under the current NRC and Agreement State requirements. While it is prudent to continue to look for viable alternative technologies and sources, a decision on whether to limit the further use of these sources should be based primarily on the existence of viable alternative technologies. The NRC should continue to work with its Federal and State partners to ensure the safety and security of CsCl sources. In the event that changes in the threat environment necessitate regulatory action, the NRC and Agreement States should issue additional security requirements to apply appropriate limitations for the use of CsCl in its current forms or for its replacement with suitable alternatives.

Summary Table of 2006 Recommendations and Actions and 2010 Recommendations

The following table presents the Task Force 2006 recommendations and actions and the new 2010 recommendations. The table indicates the type of action that may be necessary to implement the recommendation—legislative change, regulatory change (those recommendations that would require a policy, rule, or procedure change or development in order to implement) or neither (those recommendations that do not involve a change in law or regulation). The table also indicates the status of the recommendation or action and a reference to the applicable page and chapter in the 2006 and/or 2010 reports where the initiative is discussed.

	Recommendations and Actions	Legislative Change	Regulatory Change	Status	Page Number, Report, and Chapter Reference
2006 Recommendation 3-1	The Task Force recommends that the U.S. Government periodically reevaluate the list of radioactive sources that warrant enhanced security and protection to assess their adequacy in light of the evolving threat environment [and consistent with current national consequences of concern in order to provide a consistent level of protection with other critical infrastructure].			Ongoing, reassessed in 2009 as part of periodic reevaluations with consideration of amended bracketed text	8 (2006 report - "Radioactive Source List" and 2010 report – "Advances in the Security and Control of Radioactive Sources")
2006 Action 3-1	The NRC should evaluate the need to reissue the Orders to the Manufacturing and Distribution Licensees to make sure no security issues have been introduced from the use of different units of radioactivity.			Complete	14 (2006 report - "Radioactive Source List" and 2010 report – "Advances in the Security and Control of Radioactive Sources")

	Recommendations and Actions	Legislative Change	Regulatory Change	Status	Page Number, Report, and Chapter Reference
2006 Action 3-2	The Department of Transportation (DOT) should examine the use of the Code of Conduct Category 1 and 2 thresholds in domestic transportation regulations.			Complete	23 (2006 report - "Radioactive Source List" and 2010 report – "Advances in the Security and Control of Radioactive Sources")
2006 Recommendation 4-1	The Task Force recommends that there be a coordinated public education campaign (Federal, State, and industry) to reduce fears of radioactivity, diminish the impact of a radiological attack if one were to occur, and provide a deterrent to attackers considering the use of radiological materials.			Transitioned from the Task Force to FEMA	4 (2006 report – "Security and Control of Radioactive Sources" and 2010 report – "Coordination and Communication Improvements")
2006 Recommendation 4-2	The Task Force recommends that the Federal agencies and States continue efforts to improve coordination and communication of their ongoing activities in the area of radiation protection and security for Category 1 and 2 sources.			Ongoing	5 (2006 report – "Security and Control of Radioactive Sources" and 2010 report – "Coordination and Communication Improvements")

	Recommendations and Actions	Legislative Change	Regulatory Change	Status	Page Number, Report, and Chapter Reference
2006 Action 4-1	The NRC should consider imposing additional measures to verify the validity of licenses, before transfer of risk-significant radioactive sources, on all licensees authorized to possess Category 1 and 2 quantities of radioactive material.			Ongoing	19 (2006 report – "Security and Control of Radioactive Sources" and 2010 report –"Advances in the Security and Control of Radioactive Sources")
2006 Recommendation 5-1	The Task Force recommends development of a Transport Security Memorandum of Understanding to serve as the foundation for cooperation in the establishment of a comprehensive and consistent transport security program for risk-significant sources.			Completion expected in 2010	23 (2006 report – "Transportation Security of Radioactive Sources" and 2010 report – "Advances in the Security and Control of Radioactive Sources")

	Recommendations and Actions	Legislative Change	Regulatory Change	Status	Page Number, Report, and Chapter Reference
2006 Recommendation 5-2	The Task Force recommends that the U.S. Government evaluate the feasibility of using new and existing technologies to detect and discourage the theft of risk-significant radioactive material during transport. The evaluation should include the findings of operational testing of existing technologies offering enhanced security of motor carrier shipments of hazardous material; shipment tracking, including communication systems; radio-frequency identification; vehicle disabling technologies; and mobile and stationary radiation detection systems.			Ongoing	23 (2006 report – "Transportation Security of Radioactive Sources" and 2010 report – "Advances in the Security and Control of Radioactive Sources")
2006 Recommendation 5-3	The Task Force recommends that the U.S. Government immediately develop a strategy and take actions to address the security of international shipments of Category 1 and 2 radioactive sources that transit or are transshipped through the land territory of the United States.		Yes	Ongoing	24 (2006 report – "Transportation Security of Radioactive Sources" and 2010 report – "Advances in the Security and Control of Radioactive Sources")
2006 Action 5-1	The Transportation Security Subgroup should review the findings and conclusions of all research conducted on securing "high hazard" hazardous materials transport to determine if any of the measures should be applied to transport of risk-significant radioactive sources.			Ongoing	25 (2006 report – "Transportation Security of Radioactive Sources" and 2010 report – "Advances in the Security and

	Recommendations and Actions	Legislative Change	Regulatory Change	Status	Page Number, Report, and Chapter Reference
					Control of Radioactive Sources")
2006 Action 5-2	DOT should evaluate the best practices from the high-threat urban area corridor assessments to determine whether it should incorporate any of the best practices into the requirements for security plans for high-risk radioactive material. DOT should also evaluate whether transport of lower risk radioactive material warrants a security plan or whether the transport could be exempted from some of the requirements.			Complete	26 (2006 report – "Transportation Security of Radioactive Sources" and 2010 report – "Advances in the Security and Control of Radioactive Sources")
2006 Action 6-1	The NRC should expeditiously complete its implementation of the fingerprinting provisions of the EPAct for those applicants for and licensees with Category 1 and 2 quantities of radioactive material. The NRC should place a high priority on completing the EPAct Section 652 rulemaking. As part of the rulemaking, the NRC should require fingerprinting for any individual who could have access to Category 2 or above quantities of radioactive materials. The NRC should also require periodic reinvestigations of such persons.	Likely		Ongoing	15 (2006 report – "Background Checks" and 2010 report – "Advances in the Security and Control of Radioactive Sources")
2006 Action 6-2	The NRC should evaluate the feasibility of establishing a national database for materials licensees that would contain information on pending applications and information on individuals cleared for unescorted access.			Ongoing	16 (2006 report – "Background Checks" and 2010 report – "Advances

	Recommendations and Actions	Legislative Change	Regulatory Change	Status	Page Number, Report, and Chapter Reference
					in the Security and Control of Radioactive Sources")
2006 Action 6-3	The NRC and DHS should enter into a memorandum of understanding to cover access to the SAVE database for materials licensees.			Complete	16 (2006 report – "Background Checks" and 2010 report – "Advances in the Security and Control of Radioactive Sources")
2006 Action 7-1	The NRC should evaluate requiring licensees to review and document the reasons for storage of risk-significant sources longer than 24 months and the feasibility of establishing a maximum time limit on the long-term storage of risk-significant sources not in use.			Complete	37 (2006 report – "Storage of Radioactive Sources" and 2010 report – "Status of the Recovery and Disposition of Radioactive Sources")
2006 Recommendation 9-1	The Task Force recommends that the U.S. Government further evaluate the waste disposal options as outlined in the GAO reports on LLRW.			Complete	35 (2006 report – "National System to Provide for the Proper Disposal of Radioactive Sources" and 2010

	Recommendations and Actions	Legislative Change	Regulatory Change	Status	Page Number, Report, and Chapter Reference
					report – "Status of the Recovery and Disposition of Radioactive Sources")
2006 Recommendation 9-2	The Task Force recommends that the NRC evaluate the financial assurance required for possession of Category 1 and 2 radioactive sources to assure that funding is available for final disposition of the sources.			Complete	36 (2006 report – "National System to Provide for the Proper Disposal of Radioactive Sources" and 2010 report – "Status of the Recovery and Disposition of Radioactive Sources")
2006 Action 9-1	The DOE should continue its ongoing efforts to develop GTCC disposal capability.	Possibly		Ongoing	36 (2006 report – "National System to Provide for the Proper Disposal of Radioactive Sources" and 2010 report – "Status of the Recovery and Disposition of Radioactive Sources")

	Recommendations and Actions	Legislative Change	Regulatory Change	Status	Page Number, Report, and Chapter Reference
2006 Action 10-1	The U.S. Government should continue the efforts to promote international harmonization of import and export controls for Category 1 and 2 radioactive sources.			Ongoing	27 (2006 report – "Import and Export Controls for Radioactive Sources" and 2010 report – "Advances in the Security and Control of Radioactive Sources")
2006 Action 10-2	The U.S. Government should encourage suppliers to provide arrangements for the return of disused sources and examine means to reduce regulatory impediments that currently make this option unavailable.			Ongoing	27 (2006 report – "Import and Export Controls for Radioactive Sources" and 2010 report – "Advances in the Security and Control of Radioactive Sources")
2006 Action 10-3	The Task Force suggests the use of education and the creation of incentives to discourage the export of used Category 1 and 2 radioactive sources as an alternative to disposal.			Ongoing	28 (2006 report – "Import and Export Controls for Radioactive Sources" and 2010 report – "Advances in the Security and

	Recommendations and Actions	Legislative Change	Regulatory Change	Status	Page Number, Report, and Chapter Reference
					Control of Radioactive Sources")
2006 Action 10-4	The U.S. Government should improve the interagency evaluation of recipient authorization and recipient country controls to prevent the fraudulent acquisition of risk-significant sources exported from the United States.			Complete	29 (2006 report – "Import and Export Controls for Radioactive Sources" and 2010 report – "Advances in the Security and Control of Radioactive Sources")
2006 Action 10-5	[The] NRC should consider reevaluating the need for a specific license to allow the import of Category 1 and 2 radioactive sources to a U.S.-licensed user.			Complete	29 (2006 report – "Import and Export Controls for Radioactive Sources" and 2010 report – "Advances in the Security and Control of Radioactive Sources")
2006 Action 11-1	The Task Force encourages the NSTS Interagency Coordinating Committee to develop a procedure/policy with guidelines on how to handle both Government and non-Government requests for information in the NSTS.			Complete	20 (2006 report – "National Source Tracking System" and 2010 report –

	Recommendations and Actions	Legislative Change	Regulatory Change	Status	Page Number, Report, and Chapter Reference
					"Advances in the Security and Control of Radioactive Sources")
2006 Action 11-2	The NRC should consider programming the NSTS to provide automatic daily information to [U.S.] Customs [and Border Patrol] on import/export shipment notifications.			Completion expected in 2011	21 (2006 report – "National Source Tracking System" and 2010 report – "Advances in the Security and Control of Radioactive Sources")
2006 Action 11-3	The Task Force suggests that a comprehensive analysis be conducted on the inclusion of Category 3 sources in the NSTS.			Complete	21 (2006 report – "National Source Tracking System" and 2010 report – "Advances in the Security and Control of Radioactive Sources")
2006 Recommendation 12-1	The Task Force recommends that the Alternatives Technology Subgroup evaluate financial incentives; research needs for both alternative technologies and alternative designs, including financial support; and the cost-benefit of potential alternatives for Category 1			Complete	43 (2006 report – "Alternative Technologies" and 2010 report –

	Recommendations and Actions	Legislative Change	Regulatory Change	Status	Page Number, Report, and Chapter Reference
	and 2 radioactive sources.				"Progress in the Area of Alternative Technologies")
2006 Recommendation 12-2	The Task Force recommends that high priority be given to conducting a study within 2 years to assess the feasibility of phasing out the use of CsCl in a highly dispersible form. This study should consider the availability of alternative technologies for the scope of current uses, safe and secure disposal of existing material, and international safety and security implications.			Complete	44 (2006 report – "Alternative Technologies" and 2010 report – "Progress in the Area of Alternative Technologies")
2010 Recommendation 1	The Task Force recommends that U.S. Government agencies use the radionuclides and the associated Category 2 threshold quantities in Table II, "Radionuclides that Warrant Enhanced Security and Protection" (as shown on page 11 of this report), as the appropriate framework for considering which sources warrant enhanced security* and that they adopt the definitions for a significant RED and a significant RDD (as shown on page 8 of this report) for prioritizing and allocating resources to eliminate, control, or mitigate risks of malevolent radiological incidents. * By warrants enhanced security and protection is meant enhanced in comparison to the security and protection applied to radioactive sealed sources before September 11, 2001.		Possibly		12 (2010 report – "Advances in the Security and Control of Radioactive Sources")
2010 Recommendation 2	The Task Force recommends that the U.S. Government agencies should reevaluate their protection and mitigation strategies to protect against significant RED or RDD attack using both potential		Possibly		17 (2010 report – "Advances in the Security and

	Recommendations and Actions	Legislative Change	Regulatory Change	Status	Page Number, Report, and Chapter Reference
	severe immediate or short-term exposure and contamination consequences to public health, safety, and the environment as the consequences of concern. Agencies should use the Task Force-endorsed definitions, radionuclides, and thresholds for a significant RED and RDD and the associated assumptions and parameters as common guidance in the assessment of risk and management of homeland security activities.				Control of Radioactive Sources")
2010 Recommendation 3	Contingent upon the availability of alternative technologies, the Task Force recommends that the NRC evaluate whether the export licensing for Category 1 and 2 CsCl sources should be discontinued, taking the availability of disposal capacity and the threat environment into consideration.		Yes		29 (2010 report – "Advances in the Security and Control of Radioactive Sources")
2010 Recommendation 4	The Task Force recommends that the U.S. Government, regional compacts, and States continue to evaluate disposal options for disused radioactive sources, including options for handling a potentially large number of disused cesium chloride sources that may be replaced once viable alternatives are available.	Possibly	Possibly		37 (2010 report – "Status of the Recovery and Disposition of Radioactive Sources")
2010 Recommendation 5	The Task Force recommends that Federal and State Governments investigate options such as providing short-term secured storage of sources recovered from U.S. owners that contain foreign-origin americium-241 radioactive material, so that these sources can be recovered now, and increase efforts to investigate options for disposal of these sources.				37 (2010 report – "Status of the Recovery and Disposition of Radioactive Sources")

	Recommendations and Actions	Legislative Change	Regulatory Change	Status	Page Number, Report, and Chapter Reference
2010 Recommendation 6	The Task Force recommends that the NRC incorporate procedures to review the status, such as the date of, the reason for, and location of sources in long-term storage, in the current inspection program.		Yes		38 (2010 report – "Status of the Recovery and Disposition of Radioactive Sources")
2010 Recommendation 7	The Task Force recommends that the U.S. Government, in collaboration with responsible State agencies, evaluate and develop a plan to improve, as necessary, processes for dealing with unwanted, abandoned, or impounded sources, including storage, reuse, recycling, or other disposition methods.				38 (2010 report – "Status of the Recovery and Disposition of Radioactive Sources")
2010 Recommendation 8	The Task Force recommends that the U.S. Government enhance support of short-term and long-term research and development of certified Type B containers for use in domestic and international source recovery efforts.				38 (2010 report – "Status of the Recovery and Disposition of Radioactive Sources")
2010 Recommendation 9	The Task Force recommends that the U.S. Government enhance support of short-term and long-term research and development for alternative technologies.				45 (2010 report – "Progress in the Area of Alternative Technologies")
2010 Recommendation 10	The Task Force recommends that the U.S. Government, contingent upon the availability of alternative technologies and taking into consideration the availability of disposal pathways for disused		Yes		45 (2010 report – "Progress in the Area of Alternative

	Recommendations and Actions	Legislative Change	Regulatory Change	Status	Page Number, Report, and Chapter Reference
	sources, investigate options such as a voluntary prioritized, Government-incentivized program for the replacement of Category 1 and 2 sources with effective alternatives, with an initial focus on sources containing CsCl.				Technologies")
2010 Recommendation 11	Contingent upon the availability of viable alternative technologies, the Task Force recommends that the NRC and the Agreement States review whether the licensing for new Category 1 and 2 CsCl sources should be discontinued, taking the threat environment into consideration.		Yes		45 (2010 report – "Progress in the Area of Alternative Technologies")

Three of the above recommendations and actions either highlight or may necessitate legislative changes. The following provides further information on how the recommendations and actions, if carried out, may impact legislation:

- 2006 Action 6-1: In implementing the Energy Policy Act of 2005 (EPAct) fingerprinting provisions for unescorted access to radioactive materials, the U.S. Nuclear Regulatory Commission (NRC) developed procedures to implement a program in which a licensee designates an individual (a reviewing officer) who is responsible for reviewing the trustworthiness and reliability information (which includes the Federal Bureau of Investigation (FBI) criminal history records checks) to grant unescorted access to other licensee employees. In some cases, such as for human resources personnel this reviewing officer does not require, or is not permitted, unescorted access as part of his or her job duties. As a result, the NRC's fingerprinting authority, as granted by the EPAct, does not extend to these reviewing officers. The importance to security of the positions filled by these reviewing officers makes it logical to give the NRC the legal authority to make them subject to fingerprinting requirements and the FBI criminal history records check. A proposed legislative amendment was submitted to Congress by letter from the NRC in June 2008 to authorize the NRC to require such individuals to submit to fingerprinting requirements such as those applicable to individuals who have unescorted access to radioactive material or access to Safeguards Information. This legislative proposal was not enacted; however, as noted in the Commission direction in SRM-SECY-09-0181 [NRC 2010d], the proposed 10 CFR Part 37 rulemaking is to include the Commission's requested statutory changes to the Atomic Energy Act of 1954 [AEA 1954] that would permit fingerprints of reviewing officials without unescorted access to radioactive material or to SGI.

- 2006 Action 9-1: Pursuant to EPAct Section 631, before the U.S. Department of Energy can issue a final decision on a disposal alternative for greater than Class C low-level radioactive waste, it must first issue a report to Congress describing the disposal alternatives under consideration and await congressional action. Some alternatives may require legislative action to implement.

- 2010 Recommendation 4: The current compact disposal system is partially working as intended, but not providing disposal options for all generators of low-level radioactive waste. Potential disposal solutions must be fostered at the highest levels of Federal and State Government, and could include actions by Congress to modify the existing legislative framework or actions within the existing legislative framework (e.g., States and licensees without disposal access requesting compact commissions and States hosting existing disposal facilities to grant an out-of-compact exemption for disposal of disused sources).

The Task Force will continue to maintain and update an implementation plan for all of these recommendations and actions. The implementation plan was developed as a living document following the issuance of the first report. The implementation plan includes timelines for completion and tracks achievements towards completion of these activities.

References

[AEA 1954] Atomic Energy Act of 1954, as amended. Pub. L. 83-703, 68 Stat. 919 (42 U.S.C. 2011 et seq.) (1954).

[Chertoff 2007] Chertoff, Michael, Secretary of Homeland Security, letter to Dale Klein, Chairman of the U.S. Nuclear Regulatory Commission. March 22, 2007. (Agencywide Documents Access and Management System (ADAMS) Accession No. ML070920220) (publicly available)

[CRCPD 2007] Conference of Radiation Control Program Directors, Inc. "SCATR Program." December 18, 2007. http://www.crcpd.org/SCATR/SCATR.html.

[DOE 2008a] Department of Energy (U.S.). DOE Directive DOE N 234.1, "Reporting of Radioactive Sealed Sources." February 27, 2008 (expired but extended by DOE Notice 251.76).

[DOE 2008b] Department of Energy (U.S.). DOE Directive DOE O 462.1, "Import and Export of Category 1 and 2 Radioactive Sources and Aggregated Quantities." November 10, 2008.

[DOE 2010] Department of Energy (U.S.). "Greater-Than-Class C Low-Level Radioactive Waste EIS Information Center." 2010. http://www.gtcceis.anl.gov/.

[DOE, et al. 2008c] Department of Energy (U.S.) and the Oilfield Services Industry. "Security and Control of High-Activity Well Logging Sources Guideline." August 8, 2008.

[DHS 2008] Department of Homeland Security (U.S.). "2008 Strategic Homeland Infrastructure Risk Assessment (SHIRA), 2008 Data Call Guidance Materials." October 10, 2008.

[DHS 2009a] Department of Homeland Security (U.S.). "2009 Strategic Homeland Infrastructure Risk Assessment (SHIRA), 2009 Data Call Guidance Materials." 2009.

[DHS 2009b] Department of Homeland Security (U.S.). "About the SAVE Program." April 23, 2009. http://www.uscis.gov/portal/site/uscis/menuitem.5af9bb95919f35e66f614176543f6d1a/?vgnextoid=40fabff1bc0ca110VgnVCM1000004718190aRCRD&vgnextchannel=1721c2ec0c7c8110VgnVCM1000004718190aRCRD.

[DHS 2009c] Department of Homeland Security (U.S.). "National Infrastructure Protection Plan." 2009.

[DHS/FEMA 2008] Department of Homeland Security (U.S.), Federal Emergency Management Agency. "Planning Guidance for Protection and Recovery Following Radiological Dispersal Device (RDD) and Improvised Nuclear Device (IND) Incidents." *Federal Register*, Vol. 73, No. 149, August 1, 2008, pp. 45029-45048.

[DHS/TSA 2006] Department of Homeland Security (U.S.), Transportation Security Administration. "Transportation Worker Identification Credential (TWIC) Implementation in the Maritime Sector; Hazardous Materials Endorsement for a Commercial Driver's License: Notice of Proposed Rulemaking." *Federal Register*, Vol. 71, No. 98, May 22, 2006, pp. 29395–29462.

[DHS/TSA 2008] Department of Homeland Security (U.S.), Transportation Security Administration. "Rail Transportation Security: Final Rule." *Federal Register*, Vol. 73, No. 229, November 26, 2008, pp. 72129–72180.

[DHS/TSA 2010] Department of Homeland Security (U.S.), Transportation Security Administration. "Highway Security-Sensitive Materials (HSSM) Security Action Items (SAIs)." Accessed 2010. http://www.tsa.gov/what_we_do/tsnm/highway/hssm_sai.shtm.

[DOT/FMCSA 2010] Department of Transportation (U.S.), Federal Motor Carrier Safety Administration. "Hazardous Materials Safety & Security Field Operational Test." Accessed 2010. http://www.fmcsa.dot.gov/safety-security/hazmat/fot/index.htm.

[DOT/PHMSA 2006] Department of Transportation (U.S.), Pipeline and Hazardous Materials Safety Administration. "Hazardous Material: Revision of Requirements for Security Plans: Advance Notice of Proposed Rulemaking (ANPRM) and Announcement of Public Meeting." *Federal Register*, Vol. 71, No. 183, September 21, 2006, pp. 55156–55159.

[DOT/PHMSA 2008a] Department of Transportation (U.S.), Pipeline and Hazardous Materials Safety Administration. "Hazardous Materials: Enhancing Rail Transportation Safety and Security for Hazardous Materials Shipments: Final Rule." *Federal Register*, Vol. 73, No. 229, November 26, 2008, pp. 72181–72194.

[DOT/PHMSA 2008b] Department of Transportation (U.S.), Pipeline and Hazardous Materials Safety Administration. "Hazardous Materials: Risk-Based Adjustment of Transportation Security Plan Requirements: Notice of Proposed Rulemaking." *Federal Register*, Vol. 73, No. 175, September 9, 2008, pp. 52558–52572.

[DOT/PHMSA 2010] Department of Transportation (U.S.), Pipeline and Hazardous Materials Safety Administration. "Hazardous Materials: Risk-Based Adjustment of Transportation Security Plan Requirements: Final Rule." *Federal Register*, Vol. 75, No. 45, March 9, 2010, pp. 10974–10989.

[EPA 1992] Environmental Protection Agency (U.S.). EPA 400-R-92-001, "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents." 1992.

[EPAct 2005] Energy Policy Act of 2005. Pub. L. 109-58, Sec. 170H.f. August 8, 2005.

[GAO 2004] Government Accountability Office (U.S.). GAO-04-604, "Disposal Availability Adequate in the Short Term, but Oversight Needed to Identify Any Future Shortfalls." June 2004.

[GAO 2007] Government Accountability Office (U.S.). GAO-07-1038T, "Testimony Before the Permanent Subcommittee on Investigations, Committee on Homeland Security and Governmental Affairs, United States Senate, 'Actions Taken by NRC to Strengthen Its Licensing Process for Sealed Radioactive Sources Are Not Effective.'" July 12, 2007.

[IAEA 2004] International Atomic Energy Agency. "Code of Conduct on the Safety and Security of Radioactive Sources." January 2004.

[IAEA 2005] International Atomic Energy Agency. "Guidance on the Import and Export of Radioactive Sources." March 2005.

[IAEA 2008] International Atomic Energy Agency. Nuclear Security Series No. 9, "Security in the Transport of Radioactive Material." September 2008.

[IAEA 2009a] International Atomic Energy Agency. "Measures to Strengthen International Cooperation in Nuclear, Radiation, Transport and Waste Safety (GC(53)/RES/10)." September 18, 2009.

[IAEA 2009b] International Atomic Energy Agency. "Nuclear Security, Including Measures to Protect Against Nuclear and Radiological Terrorism (GC(53)/RES/11)." September 18, 2009.

[Klein 2008] Klein, Dale, Chairman of the U.S. Nuclear Regulatory Commission, letter to Nancy Pelosi, Speaker of the House of Representatives. June 9, 2008. (ADAMS Accession No. ML081550569) (publicly available)

[LLRWPAA 1985] Low-Level Radioactive Waste Policy Amendments Act (LLRWPAA) of 1985, as amended. Pub. L. 99-240. 1985.

[NA 2008] National Research Council of the National Academies. "Radiation Source Use and Replacement, Abbreviated Version." 2008.

[NRC 2005a] Nuclear Regulatory Commission (U.S.). "Export and Import of Radioactive Materials: Security Policies: Final Rule." *Federal Register*, Vol. 70, No. 126, July 1, 2005, pp. 37985–37994.

[NRC 2005b] Nuclear Regulatory Commission (U.S.). "In the Matter of All Licensees Authorized To Possess Radioactive Material Quantities of Concern, Order Imposing Increased Controls (Effective Immediately)." *Federal Register*, Vol. 70, No. 230, December 1, 2005, pp. 72128–72132.

[NRC 2006a] Nuclear Regulatory Commission (U.S.). FSME-06-114, "Implementation of Pre-Licensing Guidance." December 21, 2006. (ADAMS Accession No. ML063560340) (publicly available)

[NRC 2006b] Nuclear Regulatory Commission (U.S.). "In the Matter of Holders of Material Licenses Authorized To Manufacture or Distribute Items Containing Radioactive Material of Concern; Order Imposing Fingerprinting and Criminal History Records Check Requirements for Unescorted Access to Certain Radioactive Material and Modification of the Additional Security Measures (Effective Immediately)." *Federal Register,* Vol. 71, No. 208, October 27, 2006, pp. 63046–63050.

[NRC 2006c] Nuclear Regulatory Commission (U.S.). "Radiation Source and Protection Task Force Report." August 15, 2006.

[NRC 2007a] Nuclear Regulatory Commission (U.S.). "In the Matter of: Licensees Authorized To Possess Radioactive Material Quantities of Concern; Order Imposing Fingerprinting and Criminal History Records Check Requirements for Unescorted Access To Certain Radioactive Material (Effective Immediately)." *Federal Register*, Vol. 72, No. 239, December 13, 2007, pp. 70901–70905.

[NRC 2007b] Nuclear Regulatory Commission (U.S.). SECY-07-0147, "Response to U.S. Government Accountability Office Recommendations and Other Recommendations to Address Security Issues in the U.S. Nuclear Regulatory Commission Materials Program." August 25, 2007.

[NRC 2007c] Nuclear Regulatory Commission (U.S.). SRM-SECY-07-0147, "Staff Requirements—SECY-07-0147—Response to GAO Recommendations and Other Recommendations to Address Security Issues in the NRC Materials Program." September 18, 2007.

[NRC 2008a] Nuclear Regulatory Commission (U.S.). "Cesium Workshop 2008." December 16, 2008. http://www.nrc.gov/materials/miau/licensing.html.

[NRC 2008b] Nuclear Regulatory Commission (U.S.). "Expansion of the National Source Tracking System: Proposed Rule." *Federal Register*, Vol. 73, No. 71, April 11, 2008, pp. 19749–19761.

[NRC 2008c] Nuclear Regulatory Commission (U.S.). "Final Report of the Independent External Review Panel to Identify Vulnerabilities in the U.S. Nuclear Regulatory Commission's Materials Licensing Program." March 11, 2008. (ADAMS Accession No. ML080700957) (publicly available)

[NRC 2008d] Nuclear Regulatory Commission (U.S.). "Protection of Safeguards Information: Final Rule." *Federal Register*, Vol. 73, No. 207, October 24, 2008, pp. 63545–63582.

[NRC 2008e] Nuclear Regulatory Commission (U.S.). Regulatory Issue Summary 2008-12, "Considerations for Extended Interim Storage of Low-Level Radioactive Waste by Fuel Cycle and Materials Licensees." May 9, 2008.

[NRC 2008f] Nuclear Regulatory Commission (U.S.). SECY-08-0184, "Strategy for the Security and Use of Cesium-137 Chloride Sources." November 24, 2008.

[NRC 2009a] Nuclear Regulatory Commission (U.S.). "Limiting the Quantity of Byproduct Material in a Generally Licensed Device." *Federal Register*, Vol. 74, No. 147, August 3, 2009, pp 38372–38381.

[NRC 2009b] Nuclear Regulatory Commission (U.S.). "No NSTS expansion at this time." October 9, 2009. http://www.nrc.gov/security/byproduct/nsts/nsts-expansion.html.

[NRC 2009c] Nuclear Regulatory Commission (U.S.). "Physical Protection of Byproduct Material: Availability of Preliminary Draft Rule Language." *Federal Register*, Vol. 74, No. 83, May 1, 2009, pp. 20235–20236.

[NRC 2009d] Nuclear Regulatory Commission (U.S.). SECY-09-0181, "Proposed Rule: Physical Protection of Byproduct Material (RIN 3150-AI12)." December 14, 2009.

[NRC 2009e] Nuclear Regulatory Commission (U.S.). SRM-SECY-08-0184, "Staff Requirements—SECY-08-0184—Strategy for the Security and Use of Cesium-137 Chloride Sources." April 15, 2009.

[NRC 2010a] Nuclear Regulatory Commission (U.S.). "Certain Licensees Requesting Unescorted Access to Radioactive Material; Order Imposing Trustworthiness and Reliability Requirements for Unescorted Access to Certain Radioactive Material (Effective Immediately)." *Federal Register*, Vol. 75, No. 1, January 4, 2010, pp. 160–166.

[NRC 2010b] Nuclear Regulatory Commission (U.S.). "Implementation Guidance for Physical Protection of Byproduct Material; Category 1 and Category 2 Quantities of Radioactive Material." *Federal Register*, Vol. 75, No. 134, July 14, 2010, pp. 40756-40757.

[NRC 2010c] Nuclear Regulatory Commission (U.S.). "Request for Comments on the Draft Policy Statement on the Protection of Cesium-137 Chloride Sources and Notice of Public Meeting." *Federal Register*, Vol. 75, No. 124, June 29, 2010, pp. 37483–37488.

[NRC 2010d] Nuclear Regulatory Commission (U.S.). SRM-SECY-09-0181, "Staff Requirements—SECY-09-0181—Proposed Rule: Physical Protection of Byproduct Material (RIN 3150-AI12)." May 13, 2010.

[Stafford Act 2007] Robert T. Stafford Disaster Relief and Emergency Assistance Act, Pub. L. No. 93-288 (2007).

[10 CFR Part 20] *U.S. Code of Federal Regulations*, "Standards for Protection against Radiation," Part 20, Chapter I, Title 10, "Energy."

[10 CFR Part 32] *U.S. Code of Federal Regulations*, "Specific Domestic Licenses to Manufacture or Transfer Certain Items Containing Byproduct Material," Part 32, Chapter I, Title 10, "Energy."

[10 CFR Part 61] *U.S. Code of Federal Regulations*, "Licensing Requirements for Land Disposal of Radioactive Waste," Part 61, Chapter I, Title 10, "Energy."

[10 CFR Part 73] *U.S. Code of Federal Regulations,* "Physical Protection of Plants and Materials," Part 73, Chapter I, Title 10, "Energy."

[49 CFR Part 173] *U.S. Code of Federal Regulations,* "Shippers—General Requirements for Shipments and Packaging," Part 173, Chapter I, Title 49, "Transportation."

[49 CFR Part 1570] *U.S. Code of Federal Regulations,* "General Rules," Part 1570, Chapter XII, Title 49, "Transportation."

[49 CFR Part 1572] *U.S. Code of Federal Regulations,* "Credentialing and Security Threat Assessments," Part 1572, Chapter XII, Title 49, "Transportation."

Appendix A

Acronyms and Abbreviations

Am	americium
Be	beryllium
Cf	californium
C	carbon
Ci	curie
CIPAC	Nuclear Critical Infrastructure Partnership Advisory Council
Cm	curium
Co	cobalt
CFR	*Code of Federal Regulations, U.S.*
CRCPD	Conference of Radiation Control Program Directors
Cs	cesium
CsCI	cesium chloride
DHS	Department of Homeland Security, U.S.
DNDO	Domestic Nuclear Detection Office (DHS)
DOE	Department of Energy, U.S.
DOT	Department of Transportation, U.S.
EIS	environmental impact statement
EPA	Environmental Protection Agency, U.S.
EPAct	Energy Policy Act of 2005
FBI	Federal Bureau of Investigation
Fe	iron
FEMA	Federal Emergency Management Agency
FMCSA	Federal Motor Carrier Safety Administration
FR	Federal Register
G-8	Group of Eight
GAO	Government Accountability Office
Gd	gadolinium
GTCC	greater than Class C
GTRI	Global Threat Reduction Initiative
I	iodine
IAEA	International Atomic Energy Agency
IDD	in-device delay
IERP	Independent External Review Panel
Ir	iridium
LLRW	low-level radioactive waste
LLRWPAA	Low-Level Radioactive Waste Policy Amendments Act of 1985
LVS	License Verification System

M&D	manufacturing and distribution
MOU	memorandum of understanding
NGCC	Nuclear Government Coordinating Council
NIPP	National Infrastructure Protection Plan
NNSA	National Nuclear Security Administration (DOE)
NRC	Nuclear Regulatory Commission, U.S.
NSCC	Nuclear Sector Coordinating Council
NSOI	Nuclear Smuggling Outreach Initiative
NSTS	National Source Tracking System
OSRP	Offsite Source Recovery Project
PHMSA	Pipeline and Hazardous Materials Safety Administration
Pm	promethium
PNSP	Preventing Nuclear Smuggling Program
Po	polonium
Pu	plutonium
Ra	radium
RCRA	Resource Conservation and Recovery Act
RDD	radiological dispersal device
RED	radiation exposure device
RSRT	Radiological Source Registry and Tracking
SAVE	Systematic Alien Verification for Entitlements
SCATR	Source Collection and Threat Reduction Program
Se	selenium
SGI	Safeguards Information
Sr	strontium
Task Force	Interagency Task Force on Radiation Source Protection and Security
Tm	thulium
TSA	Transportation Security Administration
U.S.	United States
U.S.C.	United States Code
W	tungsten
WBL	Web-Based Licensing system
Y	yttrium
Yb	ytterbium

Appendix B

Glossary

Agreement State
An Agreement State is a State that has signed an agreement with the U.S. Nuclear Regulatory Commission (NRC) under which the State regulates the use of byproduct, source, and small quantities of special nuclear material within that State. There are currently 37 Agreement States.

Becquerel (Bq)
One of three units used to measure radioactivity, which refers to the amount of ionizing radiation released when an element (such as uranium) spontaneously emits energy as a result of the radioactive decay (or disintegration) of an unstable atom. Radioactivity is also the term used to describe the rate at which radioactive material emits radiation, or how many atoms in the material decay (or disintegrate) in a given time period. As such, 1 Bq represents a rate of radioactive decay equal to 1 disintegration per second, and 37 billion (3.7×10^{10}) Bq equals 1 curie (Ci).

Prefixes may be added to Bq, e.g., kBq (kilobecquerel, 10^3 Bq), MBq (megabecquerel, 10^6 Bq), GBq (gigabecquerel, 10^9 Bq), TBq (terabecquerel, 10^{12} Bq), and PBq (petabecquerel, 10^{15} Bq).

Blue Ribbon Commission on America's Nuclear Future
Established by President Obama in January 2010, the Blue Ribbon Commission on America's Nuclear Future was formed to provide recommendations for developing a safe, long-term solution to managing the Nation's used nuclear fuel and nuclear waste. The Commission is being co-chaired by former Congressman Lee Hamilton and former National Security Advisor Brent Scowcroft and is made up of 15 members who have a range of expertise and experience in nuclear issues, including scientists, industry representatives, and respected former elected officials. The Commission will produce an interim report within 18 months and a final report within 24 months that will provide advice and recommendations on issues including alternatives for the storage, processing, and disposal of civilian and defense spent nuclear fuel and nuclear waste.

Compact
A group of two or more States that have formed business alliance to dispose of low-level radioactive waste on a regional basis, as authorized by the Low-Level Radioactive Waste Act of 1980, as amended.

Curie
One of three units used to measure the intensity of radioactivity in a sample of material. This value refers to the amount of ionizing radiation released when an element (such as uranium) spontaneously emits energy as a result of the radioactive decay (or disintegration) of an unstable atom. Radioactivity is also the term used to describe the rate at which radioactive material emits radiation, or how many atoms in the material decay (or disintegrate) in a given time period. As such, 1 Ci is equal to 37 billion (3.7×10^{10}) disintegrations per second, so 1 Ci also equals 37 billion (3.7×10^{10}) Bq. A curie is also a quantity of any radionuclide that decays at a rate of 37 billion disintegrations per second (1 gram of radium (Ra-226), for example). The curie is named after Marie and Pierre Curie, who discovered radium in 1898.

Deterministic Effect
A deterministic effect is a health effect of radiation for which a threshold level of dose generally exists, above which the severity of the effect is greater for a higher dose. Such an effect is described as a "severe deterministic effect" if it is fatal or life threatening or results in a permanent injury that decreases the quality of life.

Disposal
Disposal is the emplacement of radioactive sources in an appropriate facility without the intention of retrieval.

Disused Source
A disused source is a radioactive source that is no longer used, and is not intended to be used, for the practice for which an authorization has been granted.

Freedom of Information Act, Public Law No. 110-175
It was signed into law by President Lyndon B. Johnson on September 6, 1966 (Public Law 89-554, 80 Stat. 383; Amended 1996, 2002, 2007), and went into effect the following year. This act allows for the full or partial disclosure of previously unreleased information and documents controlled by the United States Government. The act defines agency records subject to disclosure, outlines mandatory disclosure procedures and grants nine exemptions to the statute.

General License
A general license grants authority to a person for certain activities involving byproduct material without filing an application for a specific license. The general license allows the person to receive and use the device. Certain general licenses may require registration with the NRC.

Greater than Class C Radioactive Waste
Greater than Class C (GTCC) radioactive waste is defined in the Low-Level Waste Policy Amendments Act of 1985 as low-level waste that exceeds the Class C limits in Title 10 of the *Code of Federal Regulations* (10 CFR) 61.55, "Waste Classification." This section classifies low-level waste as Classes A, B, or C, according to concentration of specific short- and long-lived radionuclides; this section also sets varying requirements on waste forms for disposal. GTCC waste is generally unacceptable for near-surface disposal.

Highway Route Controlled Quantity
A highway route controlled quantity means a quantity of radioactive material within a single package that exceeds (1) 3,000 times the A_1 value of the radionuclides as specified in 49 CFR 173.435, "Table of A_1 and A_2 Values for Radionuclides," for special form radioactive material, (2) 3,000 times the A_2 value of the radionuclides as specified in 49 CFR 173.435 for normal form radioactive material, or (3) 1,000 terabecquerels (27,000 curies), whichever is least.

Improvised Nuclear Device
Improvised nuclear devices are illicit nuclear weapons bought, stolen, or otherwise originating from a nuclear state, or a weapon fabricated by a terrorist group from illegally obtained fissile nuclear weapons material that produces a nuclear explosion.

Inimicality
In this report, "inimical to" means adverse, detrimental, or unfavorable to the common defense and security. Noninimicality to the common defense and security of the United States of an

export or import of radioactive material from or into the United States is a principal criterion for the NRC to determine whether to approve the export or import.

License
A permit, granted by an appropriate governmental body, allowing an entity to carry on some authority subject to regulation by the governmental body. The NRC issues licenses subject forth in Title 10 CFR, or an Agreement State issues a license under its equivalent regulations. The NRC and Agreement States issue about 21,000 specific licenses for medical, academic, and industrial uses of nuclear materials. Reactor-produced radionuclides are used extensively throughout the United States for civilian and military industrial applications, basic and applied research, the manufacture of consumer products, civil defense activities, academic studies, and medical diagnostics, treatment and research. The regulatory programs of the NRC and Agreement States are designed to ensure that licensees safely use these materials and do not endanger public health and safety nor cause damage to the environment.

Long-Term Storage
Long-term storage refers to storage with little or no limits on its duration. This type of disposition mechanism can be used while arrangements are made for final disposition because of (1) a lack of a final disposal option, (2) a lack of available funds, (3) a need for time to complete an amended or new authorization, or (4) a need for time to establish a new disposition pathway. It can also be used while the availability of transportation to a new disposition location is pending. Long-term storage can be an effective mechanism to alleviate a health and safety or security risk posed by a source. However, long-term storage may not permanently alleviate the risk associated with the source.

Mixed Waste
Mixed waste contains both hazardous waste [as defined by the Resource Conservation and Recovery Act (RCRA) and its amendments] and radioactive waste (as defined by Atomic Energy Act and its amendments). It is jointly regulated by NRC or NRC's Agreement States and the U.S. Environmental Protection Agency (EPA) or EPA's RCRA Authorized States.

Orphan Source
An orphan source is a radioactive source that is not under regulatory control, either because it has never been under regulatory control or because it had been abandoned, lost, misplaced, stolen, or transferred without proper authorization.

Radiation Exposure Device
An object used to maliciously expose people, equipment, and/or the environment to ionizing radiation without dispersal of radioactive material.

Radioactive Source
A radioactive source is radioactive material that is permanently sealed in a capsule or closely bonded, in a solid form, and which is not exempt from regulatory control. It does not mean material encapsulated for disposal, or nuclear material within the nuclear fuel cycles of research and power reactors.

Radiological Dispersal Device
The combination of radioactive material and the means (whether active or passive) to disperse that material with malicious intent without a nuclear explosion.

Risk-Significant Source
A risk-significant source refers to Category 1 and 2 sources as defined in the International Atomic Energy Agency's (IAEA) Code of Conduct.

Risk-Significant Quantity
A risk-significant quantity refers to aggregated radioactive material that together meets or exceeds the Category 1 or 2 thresholds from the IAEA Code of Conduct.

Safeguards Information
Safeguards Information means information not otherwise classified as National Security Information or Restricted Data which specifically identifies a licensee's or applicant's detailed control and accounting procedures for the physical protection of special nuclear material in quantities determined by the NRC Commission through order or regulation to be significant to the public health and safety or the common defense and security; detailed security measures (including security plans, procedures, and equipment) for the physical protection of source, byproduct, or special nuclear material in quantities determined by the NRC Commission through order or regulation to be significant to the public health and safety or the common defense and security; security measures for the physical protection of and location of certain plant equipment vital to the safety of production or utilization facilities; and any other information within the scope of Section 147 of the Atomic Energy Act of 1954, as amended, the unauthorized disclosure of which, as determined by the NRC Commission through order or regulation, could reasonably be expected to have a significant adverse effect on the health and safety of the public or the common defense and security by significantly increasing the likelihood of sabotage or theft or diversion of source, byproduct, or special nuclear material.

Source Collection and Threat Reduction (SCATR) Program
The Conference of Radiation Control Program Directors (CRCPD) launched the SCATR Program in 2006, based on funding from the U.S. Department of Energy. This program is designed to reduce the amount of unused radioactive material stored by radioactive material licensees. SCATR provides a financial incentive for licensees to remove unwanted radioactive material from long-term storage to proper dispositioning to reduce the threat of these sources being used for malicious intent.

Special Nuclear Material
Special nuclear material is defined by Title I of the Atomic Energy Act of 1954 as (1) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the Commission, pursuant to the provisions of section 51, determines to be special nuclear material, but does not include source material; or (2) any material artificially enriched by any of the foregoing, but does not include source material.

Spent Nuclear Fuel
Spent nuclear fuel means fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated by reprocessing.

Storage
Storage refers to the holding of radioactive sources in a facility that provides for their containment with the intention of retrieval.